Engin... brary

OCT 23 1942

OCTOBER 22, 1942

The IRON AGE

Yes

HERS IS A SERVICE UNIFORM, TOO

● She helps make ball bearings. She is one of many thousands of men and women engaged in this vital work—days, nights, Sundays, holidays.

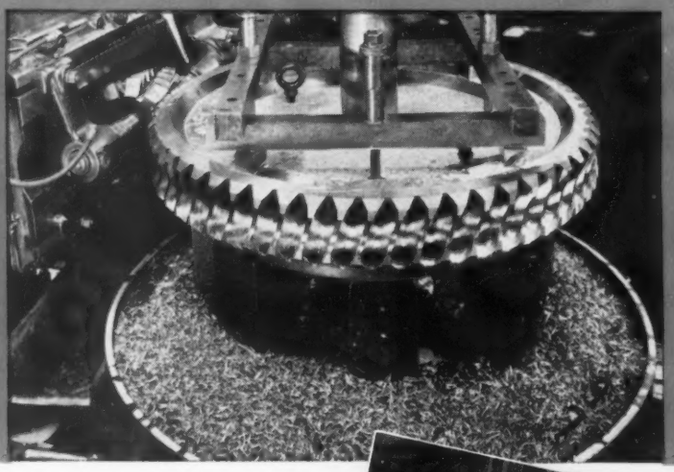
Ball bearings are used by the millions in planes and tanks and jeeps and guns and ships . . . in war machines of all kinds, wherever shafts turn. And in the machines of industry making the machines of war. Indeed in this highly mechanized mobile war "nothing rolls like a ball!" Keep 'em rolling! Yes, the smock worn by the New Departure girl is a service uniform.

New Departure Division General Motors Corporation, Bristol, Connecticut

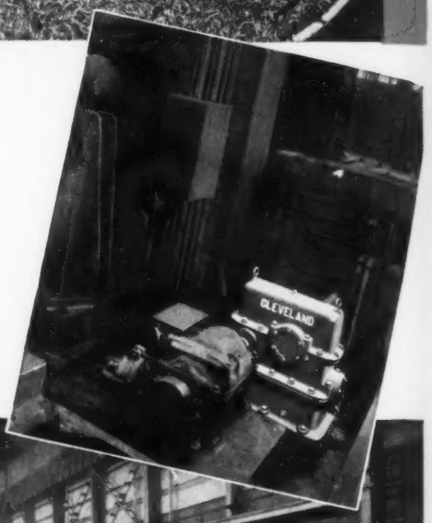
Responding to today's demand for near-perfection, New Departure research workers are gaining new engineering knowledge about design and application for the benefit of all mankind when Peace returns.

MEN AND WOMEN OF

New Departure



Prepared for *Punishment* throughout the Mill



The precision operations of worm grinding and gear hobbing illustrated above are typical of Cleveland's forethought in producing Worm Gearing for enduring service in Steel Mills.

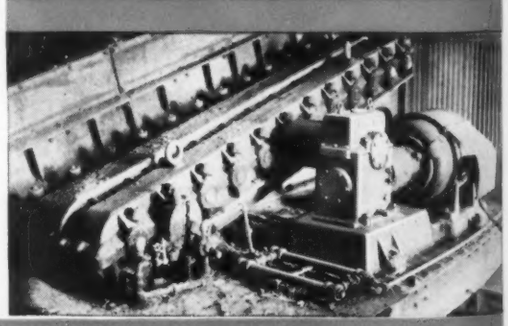
Even a bookful of pictures couldn't tell the whole story—for the priceless element of Successful Experience can't be photographed. But *you* profit by long years of knowing-how when you install Clevelands.

We began applying Worm Gearing on Steel Mill machinery 25 years ago. Today thousands of Cleveland Units are taking the punishment on all types of Mill equipment and the demand for Cleveland grows as steel production expands.

The Cleveland Worm & Gear Company, 3252 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication.

In Canada: PEACOCK BROTHERS LIMITED



CLEVELAND
WORM GEAR *Speed Reducers*

THE IRON AGE, published every Thursday by the *CHILTON CO. (INC.)*. Entered as second class matter November 8, 1932, at the Post Office at Philadelphia under act of March 3, 1879. $8 yearly in North America and South America, Foreign $15. Vol. 150, No. 17.

OCTOBER 22, 1942
VOL. 150, NO. 17

J. H. VAN DEVENTER
President and Editor

C. S. BAUR
Vice-President and General Manager

o o o

Managing Editor, T. W. LIPPERT
News & Markets Editor, J. A. ROWAN
Technical Editor, F. J. OLIVER

Associate Editors
D. R. JAMES D. C. MacDONALD
Art Editor, F. J. WINTERS

Editorial Assistants
M. M. SCHIEN G. B. WILLIAMS
J. I. BUTZNER S. H. BARMASEL
R. E. BENEDETTO

Resident District Editors
L. W. MOFFETT, Washington
T. C. CAMPBELL, Pittsburgh
J. D. BROWNE, Washington
W. A. PHAIR, Chicago
T. E. LLOYD, Cleveland
S. H. BRAMS, Detroit
OSGOOD MURDOCK, San Francisco

Editorial Correspondents
W. P. DEARING, Buffalo
ROBERT G. McINTOSH, Cincinnati
G. FRAZAR, Boston
R. RAYMOND KAY, Los Angeles
HUGH SHARP, Milwaukee
JOHN C. McCUNE, Birmingham
F. SANDERSON, Toronto, Ontario
ROY M. EDMONDS, St. Louis
C. H. BACON, Seattle

o o o

A. H. DIX, Manager Reader Service

o o o

Advertising Staff
Emerson Findley, Robert F. Blair } 621 Union Bldg., Cleveland
B. L. Herman, Chilton Bldg., Philadelphia
H. K. Hottenstein, 1012 Otis Bldg., Chicago
R. Raymond Kay, 2420 Cheremoya Ave., Los Angeles, Cal.
H. E. Leonard, 100 East 42nd St., New York
Peirce Lewis, 7310 Woodward Ave., Detroit
C. H. Ober, 100 East 42nd St., New York
W. B. Robinson, W. J. Fitzgerald } 428 Park Bldg., Pittsburgh
D. C. Warren, P. O. Box 81, Hartford, Conn.
O. L. Johnson, Market Research Mgr.
B. H. Hayes, Production Manager.
R. E. Baur, Typography and Layout.

o o o

Member, Audit Bureau of Circulations
Member, Associated Business Papers
Indexed in the Industrial Arts Index. Published every Thursday. Subscription Price North America, South America and U. S. Possessions, $8; Foreign, $15 a year.
Single copy, 35 cents.
Cable Address "Ironage N. Y."

o o o

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices	Editorial and Advertising Offices
Chestnut and 56th Sts. Philadelphia, Pa. U.S.A.	100 East 42nd St. New York, N. Y. U.S.A.

OFFICERS AND DIRECTORS
C. A. MUSSELMAN, *President*
JOS. S. HILDRETH, Vice-President
GEORGE H. GRIFFITHS, Vice-President
EVERIT B. TERHUNE, Vice-President
J. H. VAN DEVENTER, Vice-President
C. S. BAUR, Vice-President
WILLIAM A. BARBER, Treasurer
JOHN BLAIR MOFFETT, Secretary
JULIAN CHASE, THOMAS L. KANE,
G. C. BUZBY, P. M. FAHRENDORF,
HARRY V. DUFFY CHARLES J. HEALE

This Week in . . .
THE IRON AGE

Editorial

Deadline, 1942— 35

o o o

Technical Articles

Report of 24th Metal Congress: 37
Activities of Societies
Chemistry at 1600 Deg. C—ASM
War-Borne Steel Making Problems Studied—AIME
Welding Technology Spurred—AWS

Tool Engineers War Production Conference 64
Multi-Edge Tools Reclaimed by Welding 68
Workers Trade Ideas for Money 71
25-Sec. Quenching for Light Metals 72
Thompson Products Training Program 74
Precision Pipe Bending 79
Flame-Priming Method 80

o o o

Features

Assembly Line 86
Washington 90
West Coast 94
Fatigue Cracks 98
Dear Editor 100

o o o

News and Markets

This Industrial Week 102
News of Industry 105
Coming Events 109
Personals and Obituaries 142
Non-Ferrous Metals 144
Machine Tool Activity 145
Scrap Markets 146
Iron and Steel Scrap Prices 148
Comparison of Prices 149
Finished Steel Prices 150
Warehouse Prices 154

o o o

Index to Advertisers 191

Copyright, 1942, by Chilton Company (Inc.)

Answering inquiries and handling customer problems at Ryerson.

True: Steel is Short–

But Ryerson Often Solves the Problem

IN America's vast production effort, there is some man in every company who is responsible for *getting* steel—a man who must get things *done*. In some plants he's called an "expeditor". But whether he is purchasing agent, expeditor, or plant manager, he *must get results*.

Ryerson Steel Service is built to order for his needs! When steel problems become a stone wall, Ryerson usually can come thru with some practical solution. A suitable alternate for steel that's vitally needed, but isn't in stock; a suggestion for heat-treating, machining, welding, or some other way to adapt the steel at hand; rush handling and delivery that will lay the steel down where it's needed, *when* it's needed!

It's nothing new at Ryerson to be cutting corners to help customers solve steel problems with speed. Ryerson has been doing that for a century—and the experience, the skill and the knowledge of steel and its uses, built up over that hundred years of superlative service, are standing Ryerson and Ryerson customers — in good stead under today's emergency conditions.

While this is all in the day's work for Ryerson Steel-Service men—you must keep in mind that we are entirely out of many kinds and sizes and that all must be sold in strict accordance with the WPB program.

This help in getting things done is available to your organization. Ryerson Steel-Service men are easy to reach; they'll give you prompt consideration. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Philadelphia, Buffalo, Boston, Jersey City.

RYERSON STEEL–SERVICE

THE IRON AGE

OCTOBER 22, 1942

ESTABLISHED 1855

Deadline, 1942—

TODAY we must look forward and not backward. I think that you will agree with me on this premise.

Looking forward, we have to envisage the winning of this war. If we do not do that there is nothing else worth while looking forward to.

To win this war, we must have an overwhelming superiority of munitions. Airplanes, tanks, guns, projectiles, warships, merchant ships. Most of them are made primarily of steel. Steel production is going to win or lose this war.

But steel production in America depends upon scrap returns. Our melting practice in this country has been based for years on a scrap utilization of at least 50 per cent of the total ingot tonnage.

The war jacked up our steel operating rate from approximately 60 per cent of total capacity to 100 per cent. Think what that did to the demand for scrap!

This increase could not be taken up by a similar increase in pig iron production. Blast furnaces take a long time to build and even if we had been able to build them we might have experienced an ore shortage.

So today, the crux of the situation is scrap recovery.

I wonder how many of you, inside or outside the industry, realize the tremendous amount of scrap that we have to move—after we have collected it—to keep our steel mills running at 100 per cent.

To do just this we shall have to collect and move about 7 million tons of scrap in the next two months.

Figuring on an average carload of 50 tons, this movement would require the use of 140,000 carloads of 50 tons each, which would take just about one-twelfth of all our freight transportation facilities in this country.

Now to some people, this statement would be a discouraging one. The pessimists among us would say, "It can't be done." But I have never met a pessimist in our industry who has remained in it. Most of them have resigned or have been fired.

I say it can and must be done. I have enough faith in our transportation brothers to believe that they will move all that we will produce or uncover. So let's show them.

And let's begin by forgetting everything back of 1942. Let's consider all of your peacetime product models, automobiles, refrigerators or baby carriages of earlier vintage as obsolete. And let's scrap the tools and dies that pertain to them. Then, after the war is over, we can really build a new America.

The scrap drive among the domestic owners of steel pots, pans and bedsprings has been an overwhelming success. But we of industry can produce five or six times as much—and we must.

Let's go to it with 1942 as the deadline.

J. D. Vandeventer

Proper scrap metal segregation avoids loss of valuable alloys.

Irreplaceable Alloys Lost to War Program

Metallurgists Aid Needed

Metallurgists can give invaluable assistance to America's total war effort if they will help prevent the loss resulting from mixed alloy scrap. "Scrambled" scrap is never an advantage to steel mills, and it takes from war industries great quantities of scrap and irreplaceable alloys.

In many American plants segregating and classifying scrap is a co-ordinated effort by metallurgists, the design department, operating heads, supervisors, and the machine operators. New men are carefully instructed on the importance of segregating various kinds of scrap—tote boxes, designated by name and color, are removed from machines whenever a new run calls for a different kind of steel. Specially marked bins are used to accumulate quantities suitable for unit shipments. Whenever there is doubt about any scrap, it is checked by rapid qualitative tests.

Nickel-bearing scrap salvaged in twelve months in one plant contained 110,000 lbs. of pure nickel—another shop saved 75,000 lbs. of nickel and 35,000 lbs. of chromium.

You, with your knowledge of alloys and alloy steels, can advance the war program by rechecking scrap segregation methods to make certain that no precious alloy is lost.

SHEETS • STRIP • TIN PLATE • BARS • PLATES • FLOOR PLATE • STRUCTURALS
PILING • RAILS • TRACK ACCESSORIES • REINFORCING BARS

Dedicated to Victory

INLAND STEEL CO.

38 S. Dearborn Street, Chicago • Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City

War Production Problems Probed

at 24th Metal Congress

LAST week the men who will have much to do with the ending of the Second World War went to Cleveland. There, without fanfare, these men, American metallurgists and engineers, discussed in sober tones ways and means of speeding the nation's war production.

Few gatherings in 1942 will rate with this meeting, the 24th Nation Metal Congress and Exposition, in importance to the war-torn world awaiting the torrent of weapons from United States plants to bring the peace.

This gathering of an industry at war dramatized the sharp changes it had gone through in the course of a little more than a year. It showed a mature, highly-organized machine which had suffered the pains of conversion, the struggles for vital raw materials. Its leaders were veterans—without uniforms.

Despite the mighty accomplishments of this metal industry in the past, its ever expanding production goal has been accompanied by new and complex problems. And it was to seek out the answers to some of these problems that more than 10,000 metallurgists and engineers came to Cleveland last week to the National Metal Congress, sponsored by the American Society for Metals, the American Welding Society, the American Institute of Mining and Metallurgical Engineers and the Wire Association.

Information Pooled

The sober atmosphere of a nation at war also pervaded the vast Cleveland Auditorium that housed the exhibition of machinery and supplies which was held simultaneously with the technical sessions.

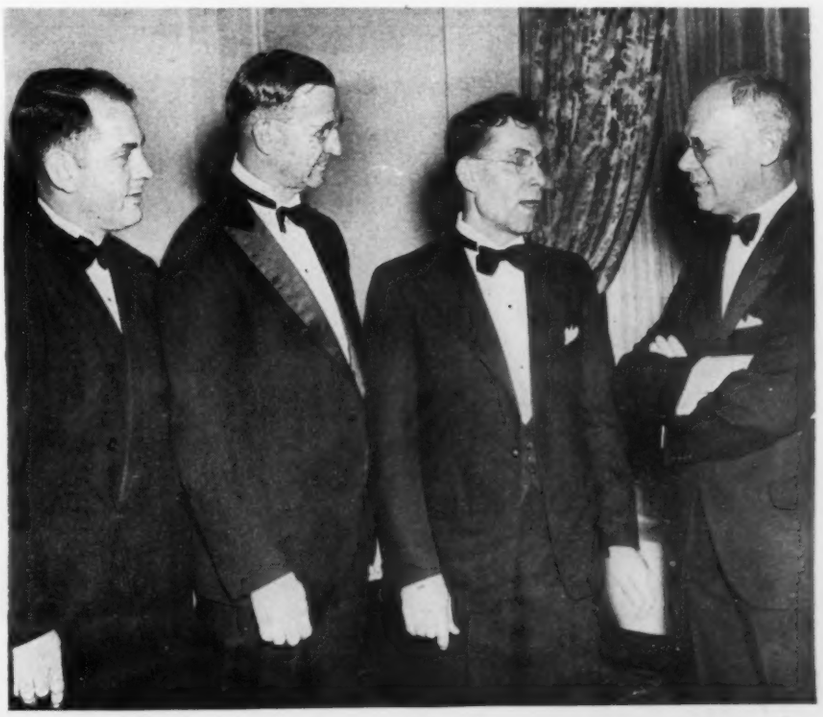
The current demand for equipment made it impossible for many exhibitors to show their new products. There was a notable absence of working exhibits.

A trip about the Exposition Hall showed, however, that the manufacturers, despite the handicap of the lack of equipment for the exhibits, were putting this opportunity to contact thousands of America's outstanding metallurgists and engineers to good use. In every booth could be seen bull sessions, with the exhibitor's service men mulling over problems with their equipment users.

This ready pooling of information, so noticeable at the Exposition Hall, carried, with emphasis, through all the technical meetings at the congress.

One of the outstanding features

THREE ASM award winners discuss war problems with Louis P. Lochner, former chief of Berlin bureau of the Associated Press, who spoke at the annual ASM banquet. The award winners are, left to right, W. A. Schlegel, metallurgical department, Carpenter Steel Co., awarded the Howe Medal; B. F. Shepherd, chief metallurgist, Ingersoll-Rand Co., winner of Sauveur Achievement Award, and J. C. Garand, inventor of the Garand rifle, winner of an ASM special award. Mr. Lochner is on the extreme right.



of the Congress this year was the group meetings on war production, patterned after last year's "defense meetings." Such problems as the working of aluminum sheet, the metallurgical aspects of the NE steels, the training of men and women for new jobs, the use of low tin alloys, reclamation, increasing the yield of electric furnaces, and the use of powdered metals, to name a few topics, were discussed by eminent authorities.

Meetings Well Attended

These meetings were all extremely well attended and, judged by the spirited discussions which developed from the floor, the subjects selected for discussion were all timely. As some of these discussions bordered on material restricted by censorship, they were all kept off the record and cannot be reported.

The annual Edward De Mille Campbell Memorial Lecture was delivered this year by John Chipman, professor of metallurgy, Massachusetts Institute of Technology. Dr. Chipman's lecture, entitled "Chemistry at 1600 Degrees C," more than lived up to the high standards established by previous Campbell Memorial lecturers. His paper was accorded an enthusiastic reception as an important contribution to metallurgical technology.

Of unusual importance as an aid to war production was the ASM lecture course on tool steels, prepared under the able direction of J. P. Gill, chief metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa. This course of five lectures dealt with definitions and classification of tool steels, effect of alloying elements, structure and properties, testing methods, etc.

Two new features of the Congress were especially interesting as "signs of the times." One of these was the Canadian luncheon sponsored by the Montreal and Ontario chapters of ASM and the Women in Metallurgy luncheon held by the Women's City Club.

A complete listing of papers presented at the meeting was published in THE IRON AGE, Oct. 1, 1942, p. 236. Abstracts of papers of timely interest are published in succeeding articles in this issue.

ASM Banquet

The responsibility of guiding the activities of the American Society for Metals through the difficult coming year was placed upon the capable shoulders of Herbert J. French, in charge of alloy iron and steel development for International Nickel Co. and senior technical consultant in charge of metallurgical and technical specifications section, Iron and Steel branch, WPB. Previous to Mr. French's election to the presidency of ASM, he served as vice-president of the society. M. A. Grossmann, director of research, Chicago District, Carnegie-Illinois Steel Corp., was elected vice-president of the society for 1943.

The presentation of awards for outstanding accomplishment, an annual feature of the society's banquet, was attended by a particularly solemn atmosphere this year. The banquet itself attracted record attendance, with an overflow of metallurgists and engineers and their wives, forcing the use of space in the halls surrounding the Grand Ball Room of the Hotel Statler where the dinner was held. Dr. Bradley Stoughton, retiring president of the society, presided at the banquet.

James P. Gill, chief metallurgist, Vanadium-Alloy Steel Co., Latrobe, Pa., a past president of the society, was presented a lecture course certificate for his authorship of a lecture series on tool steels.

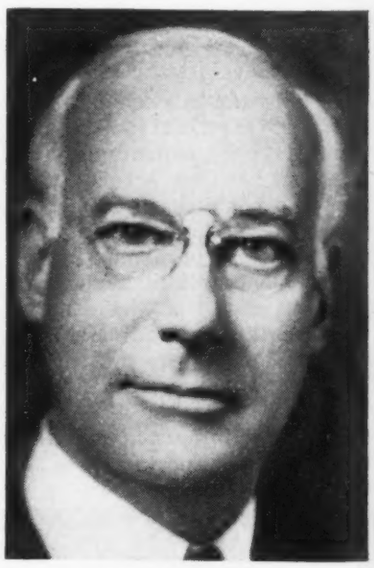
The past-presidents medal was awarded to Oscar E. Harder, assistant director, Battelle Memorial Institute, and president of the ASM for 1941. The Henry Marion Howe medal was awarded this year to W. A. Schlegel of the metallurgical department of the Carpenter Steel Co., Reading, Pa.

Benjamin F. Shepard, chief metallurgist, Ingersoll-Rand Co., Phillipsburg, N. J., was awarded the Albert Sauveur achievement medal.

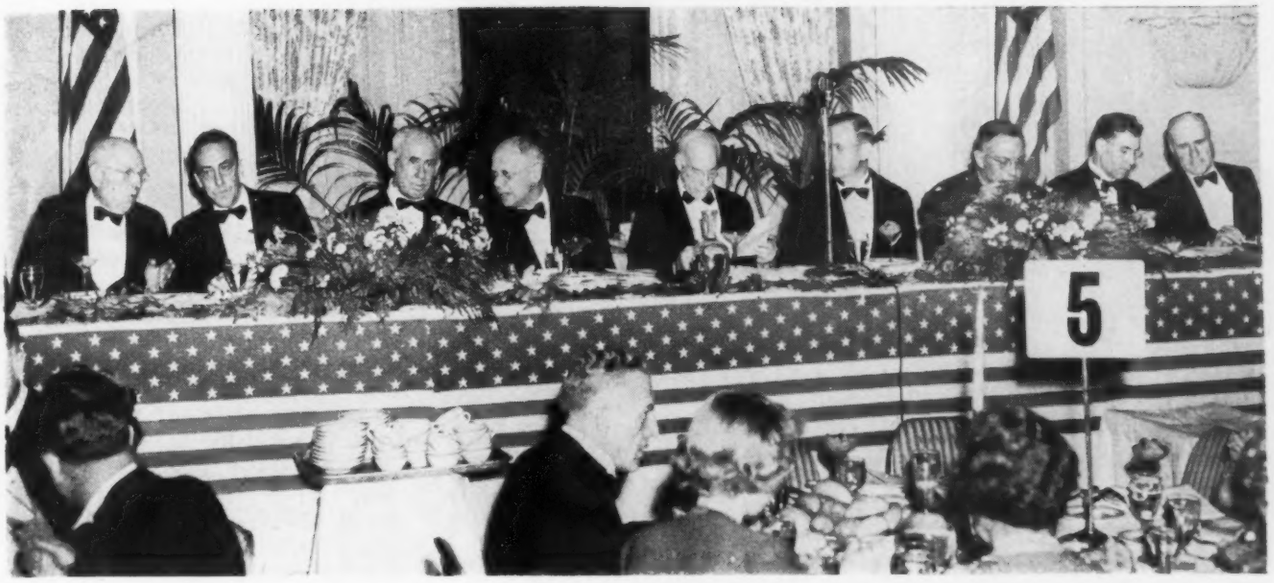
Marking somewhat of a departure from past practice, the ASM this year took special rec-

H. J. French
President-elect of ASM

M. A. Grossmann
Elected vice-president of ASM



Bradley Stoughton
Retiring president of the ASM



SOME of the notables at the speakers' table at the ASM banquet are (left to right): W. P. Woodside, H. J. French, New ASM president, Oscar E. Harder, L. P. Lochner, guest speaker, Bradley Stoughton, retiring president, B. F. Shepherd, Col. H. M. Reedall, Cleveland Ordnance district chief, J. C. Garand and Zay Jeffries.

ognition of the contributions of John C. Garand, inventor of the famous Garand rifle, with presentation to him of a special ASM medal.

The society heard a vivid description of conditions in war-torn Europe by Louis P. Lochner, former chief of the Berlin Bureau of the Associated Press.

The Edward de Mille Campbell Memorial lecture certificate was presented to John Chipman, professor of metallurgy, Massachusetts Institute of Technology, for his lecture entitled, "Chemistry at 1600 Degrees C."

AIME Sessions

The American Institute of Mining and Metallurgical Engineers devoted its technical sessions to a wide variety of theoretical and practical subjects, ranging from the wider use of rare metals in the war program to developments in steelmaking. The symposium on rare and precious metals consisted of lectures by representatives of WPB, the Bureau of Mines, Handy & Harman, Bell Telephone Laboratories, Westinghouse Electric & Mfg. Co., and other industrial users of metal who have been forced into the use of metals not so difficult to obtain.

At meetings of the Iron and Steel Division of the AIME, practical aids to steel manufacture, operating in a war economy, were prevalent. The problem of increased steel output by duplexing,

Eugene McAuliffe
President of AIME

E. C. Smith
Chairman of AIME Iron and Steel Division

C. E. Swartz
Chairman of AIME Institute of Metals Division

Presentation of the Lincoln Gold Medals by Dr. Wendell F. Hess. Recipients of awards are (left to right): G. A. Ellinger, metallurgist, National Bureau of Standards; A. G. Bissell, senior welding engineer, Bureau of Ships, U. S. Navy, and Morgan L. Williams, also of the Bureau of Standards. Col. G. F. Jenks, retiring president of the society, is at the right.

the effects of tin in steel, determination of tensile strength of steel from chemical composition, and similar subjects were covered. Also, the physical chemistry of steelmaking was covered in two technical meetings, one with a paper on the "Silicon-Oxygen Equilibria in Liquid Iron," and the other wth a paper entitled, "Equilibria of Liquid Iron and Simple Basic and Acid Slags in a Rotary Induction Furnace."

Welding Society Officers

Klaus L. Hansen, consulting engineer, Harnischfeger Corp., Milwaukee, was elected president of the American Welding Society to succeed Col. Glen F. Jenks, U. S. Army Ordnance Dept. (retired). Mr. Hansen was born in Norway and came to the United States in 1901. For many years he was connected with the Westinghouse Electric & Mfg. Co. and there designed the first single operator set marketed by the Westinghouse company. In 1919 he went with the Mechanical Appliance Co. (later the Louis Allis Co.), Milwaukee, as general manager. He left the company in 1921 to engage in consulting and development work on his own patents including the Hansen arc welder. This welder was made by the Northwestern Mfg. Co. until 1932 when it was taken over by the Harnischeger Corp.

David Arnott, who has been second vice-president of the society for the past two years, has been elevated to first vice-president. Mr. Arnott is a graduate of the Royal Technical College, Glasgow, and has had wide experience in ship construction both here and abroad. He became deputy chief surveyor, American Bureau of Shipping, from 1918 to 1925, at which time he became chief surveyor of the bureau, a position which he holds at the present time. In 1938 he also assumed the position of vice-president of the bureau. Last year the Miller Medal was awarded to Mr. Arnott for conspicuous contributions to the art and science of marine welding.

Isaac Harter, vice-president of the Babcock & Wilcox Co., was named second vice-president of the socety.

O. B. J. Fraser, director of technical services and metal production, International Nickel Co., New York, was re-elected treasurer. Miss M. M. Kelly continues as secretary of the society.

Directors at large elected by the AWS included E. V. David, assistant manager, applied engineering department, Air Reduction Sales Co.; James A. Critchett, vice-president of the Electro Metallurgical Co. and vice-president and general manager of the Union Carbide & Carbon Research Laboratories, Inc.; John D. Gordon, general manager of the Warren, Ohio, and Detroit plants of the Taylor-Winfield Corp.; and A. C. Weigel, vice-president of the Combustion Engineering Co., New York.

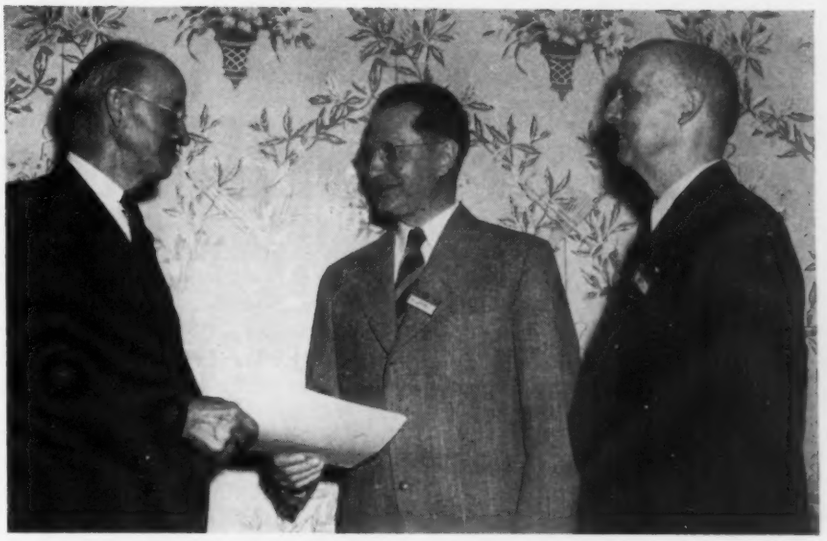
District vice-presidents elected by the AWS include Edward R. Fish (New York and New England), chief engineer, boiler division, Hartford Steam Boiler Inspection and Insurance Co.; J. N. Humberstone (Middle Eastern district), Arcrods Corp.; P. D. McElfish (Pacific Coast district), supervising engineer, Standard Oil Co. of California; K. B. Banks (Southern district), assistant to the chief engineer, Black, Sivalls & Bryson, Oklahoma City; and

K. L. Hansen
New president of welding society

David Arnott
First vice-president of AWS

John D. Tebben (Middle Western district), sales manager, metallurgical division, P. R. Mallory & Co., Inc.

The Samuel Wylie Miller Memorial award of the AWS was given this year to H. C. Boardman, research engineer, Chicago Bridge & Iron Co., Chicago, with whom he has been connected for the past 16 years. Mr. Boardman was educated at the University of Illinois and joined the Chicago Bridge & Iron Co. upon graduation. He separated from the company from 1917 to 1926, during which time he served overseas in the Army, was superintendent of the International Filter Co. of Chicago, and taught civil engineering at the University of Illinois for two years. He is a member of many engineering societies and has been the author of numerous technical articles in magazines and handbooks.



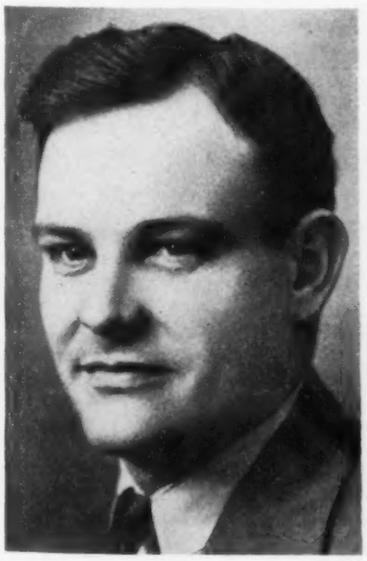
H. C. Boardman (center) is presented the AWS Samuel Wylie Miller medal by Dr. Comfort A. Adams. Smiling gentleman on right is Col. G. F. Jenks, retiring president of the Welding Society

The Lincoln Gold medal was awarded to Messrs. George A. Ellinger, National Bureau of Standards; A. G. Bissell, Bureau of Ships, Navy Department, and Morgan L. Williams, National Bureau of Standards, co-authors of the paper entitled, "The T-Bend Test to Compare the Welding Quality of Steels," judged to be the greatest contribution to the advancement of the use of welding during the past year.

The first prize of $500 in the annual award made by the Resistance Welder Manufacturers Association went to J. H. Cooper, Taylor-Winfield Corp., Warren, Ohio, for his paper entitled, "Electrical Characteristics of Resistance Welders, and the Proximity Effect of Work Materials." Second prize of $250 was awarded to Messrs F. R. Hansel, E. I. Larsen and E. F. Holt, all of P. R. Mallory & Co., Indianapolis, for co-authorship of a paper entited, "Thermal Gradients in Spot Welding Electrodes." Third prize of $100 was awarded to R. P. Della-Vedowa, Lockheed Aircraft Corp., for his paper entitled, "Use of Flash Welding as a Means of Fabricating Aircraft Structural Parts from X-4130 Steel." Fourth prize of $50 was awarded to L. G. Levoy, General Electric Co., and fifth prize of the same amount went to Messrs. G. S. Mikhalapov and T. F. Falls, both of the Taylor-Winfield Corp. Sixth prize was awarded to Messrs. A. M. Unger H. A. Matis and E. P. Gurca, all of the Pullman Standard Car Mfg. Co., Chicago.

At the Wire Association meetings, Louis H. Winkler, Bethlehem Steel Co., delivered the Mordica Memorial Lecture, which was entitled "Steel and Wire," climaxing a series of papers on the practical and technical aspects of wire manufacture and use in the war program. Included also in the program were several addresses of a general nature such as "The Progress of the War," by Capt. Melvin L. Payne, of U. S. Army, War Department, and "What Makes America Tick?" by Dr. Charles Copeland Smith, of the National Association of Manufacturers.

The problem of accidents in wire and wire products manufacturing operations was discussed by R. H. Ferguson, Republic Steel Corp. With accelerated production and forced draft operations, accidents have become an item of major importance since the supply of experienced help in wire mills is not only limited but is being tapped to a great degree by draft and enlistments, Ferguson pointed out.



J. H. Cooper

Winner of the $500 prize for a paper on resistance welding.

E. V. David

Elected director of AWS and chairman of the convention committee.

War-Born Steel Making

WITH a full program of technical papers covering both the ferrous and non-ferrous fields of metallurgy, the American Institute of Mining & Metallurgical Engineers this week met at the National Metal Congress and Exposition in Cleveland. Technical papers were presented and discussions held at meetings on Monday, Tuesday and Wednesday and on Thursday there was a general discussion of the physical chemistry of steel making at a noon luncheon.

While the papers were of a theoretical and technical nature, attention was diverted, and discussions centered around the war and the effect of metals in winning the war. It was quite interesting to note that several of the papers discussed the rarer metals in the war effort and the use of some of the rarer elements in various industries engaged in war work. Space, of course, does not permit the complete discussion of all of these papers. Consequently the attention of this review will be concentrated upon three of the papers presented, these dealing entirely with technological developments in the steel industry.

These papers were: The Chromizing of Steel by I. R. Kramer and Robert H. Hafner of the Naval Research Laboratory; Duplex Process for Manufacture of Basic Open-Hearth Steel, by H. B. Emerick and S. Feigenbaum, Jones & Laughlin Steel Corp.; and The Effects of Tin on the Properties of Plain Carbon Steel, by J. W. Halley, Inland Steel Co., Chicago.

The effects of tin on steel have become increasingly important because of the necessity of using poorly detinned scrap, tin cans and terneplate in the open-hearth charge. Since a tin can contains about 1.5 per cent tin, it is quite possible to have up to 0.75 per cent tin in steel made with a 50 per cent scrap charge. Thus, in order to use tin containing scrap, it is necessary to beware of the effect of tin on the various grades of steel and the uses to which such steels may be put. In his paper, Mr. Halley covered other published works of the effects of tin on rolling quality and physical properties of steel. He pointed out that it had been found that tin increases strength and hardness and reduces ductility and notched impact resistance, and the decrease in ductility and notched impact resistance becomes more marked as the carbon decreases.

Quickly summarizing previous investigations, the author pointed out that T. J. McKimm in an article on steel in 1940 discovered that no change in Olsen ductility, Rockwell hardness, yield strength, tensile strength, or elongation in cold-reduced strip containing up to 0.124 per cent tin was encountered, but when the tin content was raised to 0.15 per cent, difficulties were encountered in rolling and the hardness increased. However, steel containing 0.21 per cent tin showed no change in property from material containing very little tin. No explanation of this contradiction was offered.

In investigations by J. H. Andrews and J. B. Peile, in 1933, it was found that an increase in tensile strength from 100 to 200 lb. per sq. in. for each 0.01 per cent tin addition normalized samples of steels containing 0.10 to 0.25 per cent carbon and up to 0.63 per cent tin. Elongation and reduction of area were decreased and the notched impact resistance was reduced markedly. Quenched and drawn samples did not show embrittling if they were water quenched from a draw temperature of 1148 deg. F.

J. H. Whiteley, and A. Braithwaite, in an investigation some years ago on the effect of tin on rail steel containing 0.55 to 0.60 per cent carbon, found that 0.08 per cent tin caused a marked decrease in elongation, notched impact resistance and the degree of bend. Tensile strength was increased in some tests and not in others.

G. R. Bolsover and S. Barraclough in a paper read this year pointed out that the effect of tin up to 0.50 per cent on an 0.35 per cent carbon steel and on several alloy steels with from 0.30 to 0.40 per cent carbon was a comparatively uniform decrease in notched impact resistance with increasing tin on quenched and drawn samples. If the samples were quenched from the drawing temperature or reheated to the drawing temperature and quenched, embrittlement was less severe. Steels containing mo-

TABLE I—Physical Properties of 0.093-inch Gage Hot Strip with Increasing Tin Content

Ingot No.	Position of Test	Tin, Per Cent	Rockwell Hardness	Yield Strength, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent
1	Edge	0.001	B-58	35,180	48,100	28.0
2	Edge	0.010	B-58	32,440	47,240	32.5
3	Edge	0.022	B-59	37,580	47,670	34.5
4	Edge	0.041	B-58	34,310	48,510	33.2
5	Edge	0.066	B-65	44,680	54,240	26.5
1	Top center	0.009	B-52	29,220	45,780	33.0
2	Top center	0.024	B-57	36,670	47,580	33.0
3	Top center	0.056	B-55	28,980	45,600	37.5
4	Top center	0.117	B-60	30,790	48,280	37.5
5	Top center	0.157	B-62	33,510	48,800	34.0
1	Bottom center	0.001	B-48	28,270	44,400	35.5
2	Bottom center	0.014	B-61	29,430	45,420	37.0
3	Bottom center	0.028	B-53	29,380	45,320	42.5
4	Bottom center	0.056	B-64	29,500	47,100	34.0
5	Bottom center	0.081	B-61	36,080	49,230	28.2

Problems Studied . . .

lybdenum suffered much less embrittlement than other steels.

Mr. Halley's experimental work included investigations on the effect of tin on low carbon rimmed steels and semikilled structural steels and medium carbon forging steels and on rail steel. Increasing quantities of tin were added to four ingots of a heat of the following ladle analysis: carbon, 0.08 per cent; manganese, 0.39 per cent; phosphorus, 0.009 per cent; sulphur, 0.025 per cent. The tin additions amounted to 0.01 per cent for the first ingot, 0.02 per cent for the second ingot, 0.04 per cent for the third ingot and 0.06 per cent for the fourth ingot. Top and bottom slats from a comparison ingot and the tinned ingots were rolled to 0.093 gage bands on a continuous hot strip mill. No evidence of checking was found in any of the ingots rolled. Edge and center analyses of the slabs were made to determine the extent of tin segregation, it being discovered that tin segregates in a manner very similar to sulphur segregation, but to not as great a degree. Table I shows the physical properties of the hot bands.

The hardness and tensile strength of such steel are increased by tin. The effect of 0.01 per cent tin is approximately as follows: Rockwell B hardness is increased 0.6 points; tensile strength is increased 300 lb. per sq. in. When these same hot bands are cold-reduced to 0.040 in. gage cold strip and box annealed, the hardening effect of tin is not as marked and there is no apparent effect on ductility. The Rockwell B hardness is increased about 0.4 per cent for each 0.01 per cent tin addition and the tensile strength is increased about 150 lb. per sq. in.

The effect of tin on semikilled structural-grade steels was investigated by adding tin to three ingots of a heat of the following analysis: carbon, 0.21 per cent; manganese, 0.32 per cent; phosphorus, 0.010 per cent, and sulphur 0.030 per cent. The tin additions amounted to 0.10 per cent for one ingot, 0.20 per cent for the second ingot, and 0.30 per cent for the third ingot. Top, middle and bottom slabs from these ingots and one ingot with no addition were rolled to ½ x 20 in. universal mill plate. There were no serious difficulties encountered in rolling, but the two ingots containing the greatest amount of tin showed checking at the blooming mill. The finished plates all had good surfaces. Check analyses were made edge, midway and center, of the top, middle and bottom slabs. It was discovered, as in the rim steel investigations, that the tin segregates in the manner of sulphur although less severely. Physical properties of the plates in the hot rolled condition and after annealing are shown in Table II.

The effect of tin on 0.40 per cent carbon forging quality steel was investigated on an induction furnace melt of 300 lb., which was made and poured into five ingots. Tin was added to the furnace after pouring each ingot. The heat analysis was: carbon, 0.41 per cent; manganese, 0.63 per cent; phosphorus, 0.010 per cent; sulphur, 0.028 per cent; and silicon, 0.25 per cent. The tin additions aimed at 0.02, 0.04, 0.07, 0.010 and 0.20 per cent in the ingots. Small ingots were forged to 1¼ in. rounds and tested in the normalized and quenched and drawn condition. Quenched and drawn samples were cooled in air from draw temperature. Table III shows the physical properties of these ingots. Uniform decrease in ductility and impact resistance found in the lower carbon steels is not shown by the 0.40 per cent carbon steels. There is a marked drop between 0.104 and 0.227 per cent tin in both normalized and quenched and drawn samples. The increase in tensile and yield strength caused by tin appears to be somewhat greater in the lower carbon steels. Jominy end-quench tests showed no difference in hardenability in the five ingots.

Tests on rail steel were made by adding tin to three ingots of a heat running 0.77 per cent carbon, 0.82 per cent manganese, 0.010 per cent

TABLE II—Effect of Tin on Structural Steel, ½-inch Plate

Ingot No.	Position	Tin, Per Cent	Direction*	Hot-rolled					Annealed 1650 deg. F., Furnace-cooled				
				Yield Strength, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation in 8 In., Per Cent	Reduction of Area, Per Cent	Charpy Impact, Ft-Lb.	Yield Strength, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation in 8 In., Per Cent	Reduction of Area, Per Cent	Charpy Impact, Ft-Lb.
2	Top	0.028	L	35,050	60,900	31.2	52.1		29,070	51,920	30.4	58.9	
			T	36,030	60,160	25.0	41.8		27,560	51,610	30.4	55.7	
	Middle	0.030	L	38,010	62,220	25.7	55.0	31.8	28,400	53,610	27.3	53.7	14.5
			T	33,640	62,120	25.7	46.5	18.5	25,020	53,600	28.9	48.4	6.5
	Bottom	0.026	L	33,720	59,900	27.3	52.4		25,830	52,960	28.1	53.7	
			T	35,680	59,390	27.3	47.1		24,940	52,900	29.6	45.8	
3	Top	0.091	L	36,780	60,840	24.2	48.8		30,140	52,180	29.8	60.1	
			T	37,250	60,420	23.4	40.8		27,200	52,080	27.3	55.7	
	Middle	0.103	L	37,640	65,320	24.3	47.7	27.2	32,380	56,380	26.5	49.8	10.0
			T	37,270	65,200	24.3	39.1	18.2	28,810	55,990	25.0	48.0	5.0
	Bottom	0.111	L	34,100	61,620	26.5	54.4		30,700	54,070	30.4	57.4	
			T	34,500	62,200	25.7	47.1		29,030	53,770	26.5	52.0	
4	Top	0.196	L	36,320	63,580	25.0	52.0		29,840	54,910	28.1	57.9	
			T	37,890	63,660	25.0	44.6		30,490	55,780	29.6	37.0	
	Middle	0.229	L	39,250	65,640	23.4	35.2	26.0	31,170	58,650	24.2	49.3	4.2
			T	40,390	66,130	20.1	24.2	17.6	30,450	58,700	26.5	47.7	4.0
	Bottom	0.227	L	39,910	64,150	25.0	45.9		32,270	55,770	27.3	54.9	
			T	38,100	63,540	25.0	48.9		28,420	55,900	26.5	51.6	
5	Middle	0.337	L	41,120	69,200	24.2	40.1	22.2	34,080	60,920	26.8	52.0	2.5
			T	42,280	68,770	21.0	24.7	14.8	32,360	60,550	25.0	40.9	2.8
	Bottom	0.313	L	39,500	65,870	25.0	50.3		34,810	57,620	25.7	50.7	
			T	39,370	66,250	19.5	42.3		34,720	57,420	26.5	48.0	

* L stands for longitudinal; T, transverse.

phosphorus, 0.027 per cent sulphur and 0.18 per cent silicon. Tin additions were adjusted to produce ingots with 0.05, 0.08, and 0.11 per cent tin and the heat was rolled to 112 lb. per yd. rails.

Standard drop tests showed that the number of blows to failures decreased by tin and the stiffness as indicated by elongation is increased. The tin causes a moderate increase in Brinell hardness, which does not appear to be uniform, there being a sharp increase when the tin content reaches 0.05 per cent. Yield strength and tensile strength are increased much more by tin in the rail steel than in the lower carbon steels, while the lack of effect on elongation and reduction of area is probably more apparent than real, because these values are so low for rail steel and a marked reduction in ductility is easily masked by errors in measuring the elongation and reduction of the area.

A further measure of ductility was made in the form of bend tests from the heads of the I rails. The angle of bend to failure is decreased uniformly by the addition of tin. In making general observations, Mr. Halley pointed out that the lack of microscopic evidence of tin was characteristic of all the series investigated. The higher tin steels were usually slightly finer grained than the low tin steels, but the pearlite and ferrite or tempered martensite were unaltered. A number of common etching reagents were tried but none was found that showed any response characteristic of tin. The effects of tin are very similar to those of phosphorus.

In structural steels 0.01 per cent phosphorus increases tensile strength by 1000 lb. per sq. in. The same increase in strength would result from 0.05 per cent tin. It is possible to make an estimate of the effect of tin by dividing the tin content by five and adding it to the phosphorus. This analogy cannot be carried too far, however, but it is interesting to note that phosphorus forms a closed gamma loop at 0.40 per cent when alloyed with iron and that tin forms a closed gamma loop at 2.00 per cent. This ratio is indicated in the rail steel series, as the addition of 0.030 per cent phosphorus to a heat low in phosphorus would be expected to reduce resistance to the drop test but not cause a first blow failure.

Chromizing

In the paper by Irvin R. Kramer and Robert H. Hafner, entitled, "Chromizing of Steel," an investigation to determine the time temperature relationships as well as other factors pertinent to the process was discussed. As there has been considerable interest shown the past few years in surface alloyed metals, particularly alloys of chromium which has excellent corrosion resistance under a variety of severe conditions and may undergo bending and flanging operations without spalling. The authors of the paper extended their investigations beyond what had previously been done.

One method of chromizing steel developed by F. C. Kelley in 1921 consisted of heating a low carbon steel in intimate contact with powdered chromium in the presence of hydrogen at temperatures sufficiently high to permit diffusion of chromium into the steel. The usefulness of this process was limited because of the extremely high temperatures ranging from 2200 to 2550 deg. F., which caused excessive grain growth and warpage. Louenstein and Ulmer packed iron castings in ferrochromium and common salt, and heated them for about three hours at temperatures between 1700 and 1900 deg. F.

Recent and more practical methods of depositing chromium on steel surfaces have been developed in Germany and in Russia. The processes developed in these two countries are almost identical, consisting of passing gaseous chromium chloride over the steel to be chromized at temperatures ranging from 1650 to 1830 deg. F., or packing them in a porous, ceramic material that previously had been saturated with chromium chloride. A chromized layer, 0.004 in. thick, on low carbon steels was reported by this process and it was later established that there was a relationship between the carbon content and specimen dimensions after finding difficulty in chromizing steels of carbon content higher than 0.10 per cent.

A chromized case, as described by Kramer Hafner, differs from the electroplated, in that it is a diffused layer, integral with the base metal; thus avoiding difficulty encountered with cracking or peeling. Because of this, "chromizing" appeared to have definite commercial applications and it seemed desirable to determine whether an effective coating could be obtained in a reasonable time at a temperature low enough to be harmless to the steel.

In attempting to determine the time-temperature relationships by the process described, Kramer and Hafner indicate that reaction involved proceeds according to the equation

$$CrCl_2 + Fe = Cr + FeCl_2$$

Chromium atoms are deposited on the suface and diffuse in as the iron atoms diffuse out, forming a layer high in chromium.

Of the two mechanisms, chemical reaction and diffusion, the one operating at the slower rate will determine the rate of formation of the layer. In this case, diffusion will be slower, therefore any factors influencing its rate will similarly affect the process.

The rate of diffusion is influenced by the crystal structure of the base metal as well as by temperature. A depth-concentration curve for the diffusion of chromium at 2192 deg. F. shows that the concentration gradually falls off for a considerable distance and then drops sharply at 13 per cent chromium, the point coincident with the gamma loop in the iron chromium constitutional diagram. Percentage of chromium at the surface will vary from 35 to 70 per cent, depending upon the temperature and time of treatment.

In the study made by Mr. Kramer and Mr. Hafner three types of alloys were used: a plain carbon steel, a chromium-molybdenum steel, and

TABLE III—Effect of Tin on Properties of 1040 Steel

Ingot No.	Tin, Per Cent	Normalized 1600 deg. F.					Water-quenched 1550 deg. F., Drawn 1000 deg. F.				
		Yield Strength, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Charpy Impact, Ft-lb.	Yield Strength, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Charpy Impact, Ft-lb.
1	0.020	54,750	91,550	26.5	42.4	15.5	85,010	115,700	19.5	46.0	20.0
2	0.035	56,550	92,400	26.5	48.3	19.5	83,860	117,200	21.5	51.7	25.5
3	0.062	57,600	93,150	26.0	47.7	17.0	88,800	117,300	21.5	51.1	23.0
4	0.104	56,800	94,000	27.5	49.1	17.0	89,100	119,000	22.0	53.8	24.0
5	0.227	55,350	93,900	25.0	37.2	6.5	88,560	120,000	18.5	30.8	15.0

an experimental steel with 0.5 per cent molybdenum and 0.06 per cent carbon. These steels were chromized by chromium chloride produced by passing hydrogen chloride over 95 per cent ferrochromium. Tank hydrogen was passed over copper gauze at an elevated temperature to remove oxygen and then through two sulphuric acid bubbling towers to remove water vapor. A pressure regulator and flow gage were placed in the line to control and measure the flow. The purified dry hydrogen was then passed into a chamber filled with glass beads where it mixed with hydrogen chloride. Anhydrous hydrogen chloride was introduced directly into the system, since further purification was not necessary. The mixture of the two gases passed through a quartz tube into a furnace containing ferrochromium in porcelain boats at a temperature of 1400 deg. F., then into the furnace containing the specimen to be chromized. At the exit end of the apparatus a sulphuric acid bottle was placed to prevent back diffusion of water vapor.

The temperature of the chromizing furnace was automatically controlled and fluctuations in temperature were held to a minimum by inserting the thermocouple in the furnace windings. The temperature of the furnace was determined by measuring the temperature just before the run was started.

Investigations indicated that 2.5 c.c. of hydrogen chloride and 12 c.c. of hydrogen per minute gave good results. The depth of the chromized layer was determined by polishing a cross section of the specimen and etching it in 2 per cent Nital, which attacked only the regions that contained less than 13 per cent chromium and sharply delineated the higher chromium areas. The diffusion zones were measured at 400 magnifications.

TABLE IV—Chromizing Results

Alloy	Temperature, Deg. C.	Time, Hr.	Depth of Layer, Mm.	Comments
C	813	16	nil	
C	813	24	nil	
C	909	4	nil	
C	909	6	0.008	
A	1000	4	0.030	
A	1000	6	0.035	
A	1000	8	0.040	
A	1000	16	0.068	
A	1000	24	0.090	
C	1000	5	0.025	
C	1000	16	0.048	
C	1000	24	0.062	
B	1000	4	nil	
B	1000	8	nil	Formed carbide layer
A	1000	16	0.068	$BaCl_2$ method

Another method of chromizing that was used successfully was to pack the steel in a mixture of $BaCl_2.2H_2O$ and ferrochromium and heating in an atmosphere of hydrogen. This barium chloride solution partially decomposes, forming HCl, which reacts with the chromium to form chromium chloride.

The chromizing results of the steel studied are shown in Table IV. The columnar structure of the chromized layer may be revealed by a ferric-chloride-hydrochloric acid etchant.

The presence of carbon greatly influences the chromizing process. One sample when subjected to chromizing treatment for eight hours at 1832 deg. F. revealed a carbide layer which had formed and inhibited the diffusion of chromium into the base metal. The chromium-molybdenum steel C chromized without difficulty. The authors state that it appears that in order to chromize successfully the carbon must be combined with strong carbide-forming elements such as chromium or molybdenum, which decrease the diffusion rate of carbon. If this is not done, the carbon will diffuse from the interior of the steel faster than the chromium can diffuse inward, thus forming a carbide barrier. A specimen of steel containing chromium was exposed to hydrogen for a sufficient time to remove the carbon from the grain boundaries only. Upon subsequent treatment with chromium chloride, the chromium penetrated into the grain boundaries only and did not enter into the grains.

The corrosion resistance of the chromized layer is indicated by the effect of a drastic acid treatment. Specimens of the low carbon steel and the chromium steel were held at a boiling point 25 per cent nitric acid until the original base metal was completely dissolved, leaving the chromized layers unaffected.

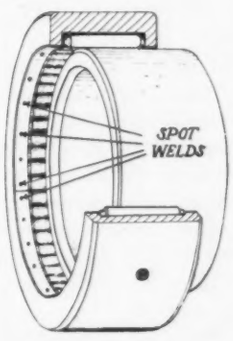
The hardness of the chromized layer as measured by the Knoop indentor was 240 Brinell, which is in the magnitude of the hardness expected in high chromium iron alloys. This low hardness of the coating aids greatly in the manufacture of parts requiring close tolerances or fitting.

A high chromium corrosion resistant coating may be produced at 1832 deg. F., through the medium of chromium chloride produced either from the reaction of hydrogen chloride or barium chloride on ferrochromium. While low carbon steels may be chromized, high carbon steels must contain sufficient strong carbide forming elements to fix the carbon.

Spot Welding Simplifies Bearing Assembly

AN improved method of installing the roller retaining rings of Bantam quill bearings by spot welding is said to produce a sturdier assembly and to cut production time on the units.

As illustrated in the accompanying sectional view, the small diameter rollers are held in place in the outer race by retaining rings. The new spot welding method of attaching these rings speeds up assembly by simplifying the machining operation and gives a positively located and permanently placed band which will not loosen under ordinary conditions.



The illustration also shows another design feature of this compact anti-friction unit. Its construction is such that in service the entire load is carried to the solid outer race since the rollers are not attached to the retaining ring according to conventional practice. Hence none of the load, axial or thrust, is against the retaining ring which serves solely to prevent the rollers from falling out of place prior to assembly of the bearing. This facilitates handling, assembly and disassembly.

Welding Technology Spurred

ALTHOUGH Col. Glen F. Jenks, in his address as retiring president of the American Welding Society, indicated that there is a tendency for the war censorship to prohibit the free publication of badly needed technical information, especially the results of research and development, nevertheless there was no dearth of papers relating to welding research presented at the 23rd annual meeting of the society. Fully one-third of the papers presented at Cleveland covered basic research, much of it in connection with substitute materials, like the National Emergency steels.

A series of three papers reported, for example, results of experiments on the weldability of carbon manganese steels, conducted by the Battelle Memorial Institute, the Naval Research Laboratory and the Climax Molybdenum Co. under the auspices of the Engineering Foundation. Hardness in the plate next to the arc weld was used as an index of weldability, the maximum figure being arbitrarily set at 350 Brinell when the structure is to be stress relieved after welding. For welds in the "as is" condition, 250 Brinell was set as the safe limit.

It was found that steels with less than 0.25 per cent carbon and less than 0.50 per cent manganese present no problem from the standpoint of loss of ductility next to the weld. Steels with more than 0.25 carbon and slightly over 0.50 manganese are borderline as to weldability when they are to be used in the as-welded condition, but present no problem when they are to be stress relieved. This is true regardless of the thickness, except that such steels may be considered weldable even for service in the as-welded state in light plate gages up to ¼ in. Steels having more than 1 per cent manganese and more than 0.30 per cent carbon may not be considered weldable, without the precaution of preheating, even in the lighter plate.

The Battelle work shows that the total of carbon plus 1/6th manganese $\left(C + \frac{Mn}{6}\right)$ may be used as an index of hardness in the ranges of 0.20 to 0.30 carbon and 0.50 to 1.00 manganese. Under the welding conditions used in the tests for 3. in. beads, the following relations seem to be indicated:

Plate Thickness, In.	¼	½	1	2
Carbon equivalent for hardness under 350 Brinell	0.65	0.55	0.45	0.40
Carbon equivalent for hardness under 250	0.48	0.40	0.35	0.32

The Naval Research Laboratory work broadly confirms the tentative conclusions from the Battelle work and further differentiates with respect to silicon content, the silicon increasing the hardenability of the steel. This work shows that for 0.20 per cent silicon, a manganese limit of 0.70 and a carbon limit of 0.30 are approximately the borderline for steels to be used in the as-welded condition. In rimmed steels or other steels containing practically no silicon, an increase in manganese content may be permitted as the equivalent of the silicon. In view of numerous ductility tests run by the Naval laboratory, it appears that these limits are more satisfactory for steel to be used as welded.

The report of the subcommittee of the Engineering Foundation indicates that the present limitation of 1 per cent manganese and 0.25 per cent carbon as a very broad specification is about right; that this limitation could be modified for special welding techniques and smaller plate thicknesses, and could be appreciably raised if preheating were considered part of the welding technique.

On the other hand, a related report on T-bend tests on carbon manganese steels presented by Leon C. Bibber and Julius Heuschkel of the Carnegie-Illinois Steel Corp. was inconclusive. The authors felt that any attempt to rate such steels in the order of their weldability would be misleading and confusing. While the low carbon, low manganese groups obviously had the best weldability and the high carbon, high manganese groups the worst, it was difficult to determine the exact order of the intermediate group. The authors did note, however, that the three steel making practices employed, namely, rimming, semi-killing and killing, as such have little effect upon weldability, particularly if other hardening elements are reduced to compensate for the presence of silicon.

Although wide differences in grain size occurred between the rimmed and the semi-skilled steels of the mild steel group, this difference had no appreciable effect on weld strength when the specimens were tested at room temperature, but the fine grain structure did show to slightly better advantage when the welds were tested at − 20 deg. F. In the medium carbon, medium manganese group and in the high carbon group, the differences in grain size were not great and the authors concluded that the effects of grain size, if any, were masked by changes in manganese and silicon content. The effect of grain size was therefore also inconclusive.

Fatigue Strength of Arc Welds

Results of a series of tests on the fatigue strength of butt welds in ⅞ in. carbon steel plates were reported on by W. M. Wilson of the University of Illinois. The primary objective of the investigation, which was underwritten by a number of public agencies and two fabricating companies, was to determine the unit fatigue strength of welds in structural members in order to be able to write into specifications for welded structures the unit stresses that shall be permitted in the design. For welds made in the flat position with a manually operated metallic arc under the most favorable conditions of operator skill, the tests indicated the following fatigue strengths for welds in the as-welded condition:

Number of cycles for failure	100,000	2,000,000
	Fatigue Strength Lb. per Sq. In.	
Tension to an equal compression	22,300	14,400
Zero to tension	33,100	22,500
Tension to tension one-half as great	53,300	36,900

By Basic Research . . .

Tests of similar groups of welds made by first-class fabricating shops working under commercial conditions indicate that an occasional commercial weld may be expected to have a fatigue strength only 75 per cent as great as the values given in the table. Of the field welds, those welded by one fabricator were as strong as the commercial welds welded in the shop. Those welded by another fabricator, on the other hand, were considerably weaker. The variations in the quality of the weld resulting from variations in the skill of the operator were greater than those resulting from the use of various electrodes. Of the welds made by automatic welding machines, those welded by the Unionmelt process were as strong as the commercial welds welded in the shop; those welded by the carbon arc process, due probably to the unfavorable form of the reinforcement, were somewhat weaker.

Reinforcements Reduces Fatigue

The change in section at the edge of the reinforcement of a butt weld is a serious stress raiser that reduces the fatigue strength considerably. Machining or grinding the reinforcement off flush with the base plate on both sides increased the fatigue strength as much as 25 per cent for specimens with good welds and made the fatigue strength for the plates connected with a weld almost as great as the fatigue strength of a similar plate without a weld.

The tests made at the University of Illinois indicate that the fatigue test is more searching than static tests and will reveal flaws in welds that pass the standard static tension and cross-bend tests. The most common flaws that cause a low fatigue strength in butt welds, listed in the order of their importance, are: (1) Lack of penetration at the root of the weld. (2) lack of fusion of the base plate, (3) slag inclusions and (4) blow holes.

An investigation of the relative fatigue properties of welds made in various boiler plate materials was reported on by E. C. Huge, Babcox & Wilcox Co., in whose shops the specimens were fabricated. These fatigue tests were also made at the University of Illinois by Professor Wilson. All 18 specimens were X-rayed, and with the exception of those with austenitic welds, were stress relieved by heat treatment. Some plates were welded, some were not. Non-welded plates were sand blasted after stress relief and a small number of surface imperfections removed. Plates with welds were ground flush and were given a medium polish across the weld so that any scratches were in the direction of stressing.

The specimens were tested on a cycle in which the stress varied from 0 to 42,000 lb. per sq. in. axial tension. The results are compared on the basis of an empirical formula which predicts the probable fatigue strength at 2,000,000 cycles when failure occurs at a lower number of cycles.

The results of the fatigue tests indicate the following fatigue strength limits for failure at 2,000,000 cycles:

70,000 lb. Tensile, Carbon-Silicon Plate:

	Lb./sq. In.
1. Plain plate, semi-polished, no weld	**38,000**
2. Plate, sand blasted, no weld	**30,000**
3. Standard weld; surface finish medium polished	**35,000**
4. Weld with porosity somewhat worse than No. 4 A.S.M.E. film	**30,000**

High-Tensile, Open-Hearth, Manganese-Molybdenum Plate:

1. Plate with high-tensile weld, medium polish	**45–50,000**
2. Plate with medium polish, no weld	**45–50,000**

70,000 lb. Carbon-Silicon Steel, with Austenitic 25-20 Weld:

1. 25-20 weld, medium polish	**30,000**
2. Croloy-5 plate with austenitic 25-20 weld, 25-20 weld medium polish finish	**31,000**

70,000 lb. Carbon-Silicon Plate with Single-Pass Weld:

The fatigue strength of the single-pass welded, medium polished specimens tested was 39-500 lb. per sq. in. The fatigue strength of the welded structure is considerably above that of sandblasted plate, so that the strength of the combination would be that of a commercial sandblasted plate.

In general, the fatigue strength of the specimens tested was of good order. The difference between commercial plate and medium polished specimens again demonstrated the effect of surface defects.

Spot Welding Hardenable Steels

Considerable research has been carried on in the past year in finding the optimum conditions for spot welding some of the hardenable steels. Dr. W. F. Hess and D. C. Herrschaft of Rensselaer Polytechnic Institute reported on studies made on the spot welding of SAE X4130 steel sheets, 0.040 in. thick. Such a steel when welded by conventional single-pulse methods produces an extremely brittle weld with low mechanical properties.

In commercial heat treating practice it is well known that hardenable steels, after being drastically quenched to martensite, can be toughened by drawing to a temperature just below the critical. This drawing allows precipitation of carbides held in super-saturated solution in the martensite, thus producing a tough, ductile transformation product by softening of the matrix.

A recent investigation by Doctor Hess and C. R. Schroder of the Great Lakes Steel Co. on N-A-X 9115 high-tensile steel showed that the brittle as-welded structure in this steel could be tempered by a brief post heat in the welding machine after allowing the weld nugget to cool just to the martensite forming temperature. Longer time off than that necessary to reach the martensite forming temperature was held to be undesirable due to the possibility of cracking of the

martensite if allowed to cool to room temperature.

The tests reported on in the current paper showed how all the variables were altered until optimum conditions for obtaining ductile spot welds in X4130 steel were obtained. These are as follows for 0.040 in. sheet:

Flat electrode diameter, in.	1/4
Electrode shape	30 deg. bevel
Unit electrode pressure, lb. per sq. in.	30,000
Corresponding total electrode force, lb.	1473
Weld time, cycles	6
Weld current, amp.	12,800-13,200
Time between weld and heat treatment, cycles	18
Time of heat treatment, cycles	6
Heat treatment current, amp.	11,400-11,800 (88-92 per cent of weld current)

The results of this investigation show that it is possible, by means of a brief post heat tempering treatment in the welding machine, to produce tough, ductile spot welds in this hardenable steel. By use of the welding conditions just mentioned, the sheer strength was raised from 1130 lb. in the as-welded condition to 2610 lb. when heat treated. At the same time the tension strength increased from 160 to 830 lb.

The authors pointed out that the time off between weld and heat treatment has a critical minimum but no noticeable critical maximum. Equally important is the fact that the heat treat current must be accurately controlled to produce the highest possible draw without rehardening by heating above the critical temperature. To aid in this control a chisel test was described as an excellent time-saving check for production set-ups.

Experience showed that if the heat treat current was too low, part of the nugget retained its brittle dendritic structure (visible to the naked eye) when the sheets were clamped in a vise and parted by tapping a chisel down between the sheets adjacent to the weld. When the heat treat current was at its best value the nugget appeared silky and a large plug was pulled out of one sheet. A great deal more energy had to be expended in order to chisel such welds than the first type mentioned. Too high a heat treat current caused rehardening and a subsequent return to as-welded brittle conditions.

This relationship between heat treating current and weld current is shown quantitatively in the accompanying chart, Fig. 1. In Fig. 2, a hardness survey made across the weld nugget cross-section just above the juncture of the two sheets is plotted for points corresponding to those in Fig. 1. This chart clearly shows the progressive softening of the weld with increase of heat treat current until rehardening is produced with excess current (93.7 per cent of weld current).

Work now being conducted on other medium carbon SAE steels indicates that this technique is generally applicable to a great many hardenable steels not commercially spot welded at present.

Spot Welding in Aircraft

Hope for speedy relaxation of restrictions on spot welding of aluminum alloys in aircraft design was expressed by E. S. Jenkins of the Curtiss-Wright Corp. He asked designers to get away from their traditional trust in rivets and take advantage of the fact that spot welded joints are three times as stiff as riveted joints. Assuming that rivets in line share a tensile load is erroneous, the speaker said. Stress distribution over the rivets is graduated and depends upon the yield in the first one or two rivets which first assume the load. Much better sharing of the load is possible with spot welding since ductility in welds is now consistently available with stored energy type spot welders. Furthermore, the fatigue values of such joints can be increased by decreasing the spot spacing. This increase is not possible with riveted joints.

Mr. Jenkins stated that the major drawback to the wider use of spot welding in aircraft is the absence of a simple, low cost, nondestructive test for the efficiency of spot welds. He regarded X-ray inspection as being too expensive for routine shop examinations.

X-Rays of Spot Welds

In the laboratory, metallographic methods have generally been used to study the characteristics of spot welded aluminum samples. These involve sectioning of the samples and hence are not altogether suitable for routine inspection in the laboratory. D. W. Smith and F. Keller, Aluminum Co. of America, indicated in another paper that they had been able to obtain a fairly good correlation between macrographs of spot welds in aluminum alloys and the features revealed by radiographic examination.

Heretofore, the radiographic method has been used chiefly to determine the presence of porosity and shrinkage cracks. It now appears possible with the proper technique to determine from radiographs the size and shape of the weld nugget as well as other metallurgical characteristics. This correlation of the results of the two methods of examination for spot welds should be helpful as a guide for the establishment of routine inspection methods as well as for future developments in spot welding technique and spot welding equipment.

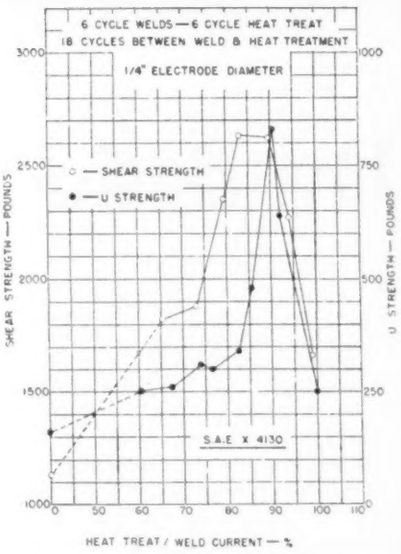


FIG. 1—Strength curves for spot welded SAE X4130 steel, showing critical effect of heat treating current in per cent of welding current, using a 6-cycle weld, 18-cycle quenching time and 6-cycle heat treat time. The entire cycle is accomplished with one pressing of the electrodes on the work. Reheating gives a ductile weld in a hardenable steel.

Magnetic Inspection of Arc Welds

Results of extensive tests on the effectiveness of the magnetic method of determining subsurface defects in arc welded rolled steel plate of the low alloy structural steel type were reported by C. H. Hastings of the Watertown Arsenal. The plates were magnetized by passing current through electrodes on either side of the weld line and from 3 to 8 in. apart. Dry ferromagnetic powder was then dusted on the plates in still air.

Some defects other than those of a crack-like nature may be detected, but the patterns caused by them may be similar in appearance to those caused by defects of another nature so that the method is not reliable for the positive identification of various types of deepseated defects. It was noted that sub-surface defects may be distinguished from surface defects by the appearance of the powder

accumulation. Surface defects cause narrow, sharply-defined patterns, while sub-surface defects cause wider, more diffuse patterns, the width of the pattern being dependent upon the width and depth of the defect. Detectability of defects is dependent upon their size, shape, and orientation, as well as upon their depth, and the thickness of section in which they are located. A defect may be detected farther below the surface in a thick section than in a thin section.

Due to the number of factors which influence the results obtained from this method, it is not reliable for positive detection of all defects, even when limited to a definite depth below the surface. Rounded defects, such as porosity in welds and some gas cavities in castings are rather difficult, if not impossible, to detect. The danger of burning or over-heating the surface of the metal and the presence of appreciable amounts of remanent magnetism in some cases limit the use of the method. It is very difficult to standardize magnetic powder patterns for the purpose of inspection. Patterns caused by different defects may be similar, thus causing confusion in interpretation of results. Inconsequential irregularities, for example, may cause confusing patterns.

Effect of Spot Weld Spacing

The effect of weld spacing on the strength of spot welded joints in 24ST Alclad has been investigated by Messrs. R. Della-Vedowa and M. M. Rockwell of Lockheed Aircraft Corp. and was reported in another paper. Tests were made on five gages of the material: 0.020, 0.032, 0.040, 0.064, and 0.081 in. The welding machines used were two Sciaky's (PMC02S) and a Federal 250-kva. a.c. machine.

Test panels 36 in. long were welded as units, and then cut into test specimens—both single spot and multi-spot. Three multi-spot specimens were tested in each material gage for each spot spacing, and the results averaged in determining strengths per linear inch for that spacing. From 50 to 100 single-spot specimens were made for each thickness.

These tests showed that although the average shear strength per spot decreased markedly when the welds are spaced close together, due to "proximity effect," nevertheless the strength of the joint per linear inch increases considerably as the spacing decreases. This is shown in Fig. 3, in which data for all the tests are summarized. On the other hand, as the spot welds become more closely spaced, a point is reached which is unsatisfactory from a production standpoint although the weld strength per linear inch continues to increase. Welds made in this range are irregular in shape and excessively cratered. Burning and surface pitting frequently occur. Applications requiring welds at such spacings (and less) should be run on a seam welder with a roll type head.

So far it has been assumed that design values should be based on some percentage of "minimum test" values. However, it is felt by many stress engineers that design values might well be based on *average* test values, or on some value below which only a given small percentage of spot strengths will fall. To provide data for further discussion along such lines, a composite frequency chart, Fig. 4, was prepared by the authors, based on all the single-spot shear specimens tested. A correction was applied by statistical methods to cover the probable behavior for an infinite number of specimens.

Refrigerated Electrodes

Judged by the character of the discussion from the floor, one of the most controversial subjects at the present time is the refrigerating of spot welding electrodes for aluminum alloys. Tests made in spot welding 24ST Alclad, 0.040 in. thick, at the laboratory of the P. R. Mallory Co., showed a disappointingly small gain in spot welds made between redressing of electrodes and only a slightly smaller amount of aluminum pickup on the electrodes when refrigerants were used as compared with results obtained with conventional water cooled tips. These tests were made with standard tips adopted by the Aircraft Resistance Welding Standards Committee. The consensus of opinion was that much better results could be obtained with electrodes having provision for much greater coolant flow and closer to the tip end. Incidentally, the tests showed that a high percentage of the heat developed was due to the passage of current through the electrode material as compared with the heat in the weld itself.

Gas Welding NE 8630 Steels

Describing experiments on the oxy-acetylene welding of NE 8630 sheet in 0.049 and 0.083 in. thicknesses, A. R. Lytle and K. H. Koopman, Union Carbide & Carbon Research Laboratory, concluded that this low alloy steel is at least equivalent to SAE X4130 steel from the standpoint of weldability, including flowing characteristics, hardness, bend and tensile properties. The better performance of the welds in NE 8630 steels in the bend test as contrasted to the occasional cracking that occurred adjacent to the welds in X4130 steel, seemed definitely to indicate greater toughness in the new steel after welding, an important attribute in steel for aircraft. Apparently, too, the tensile properties of the welded NE 8630 steels were satisfactory as they were of the same general order as those possessed by the SAE X4130 steels in the same condition.

The physical properties of welds in NE 8630 steel were compared directly with similar welds in X4130 steel, and judgment as to the suit-

o o o

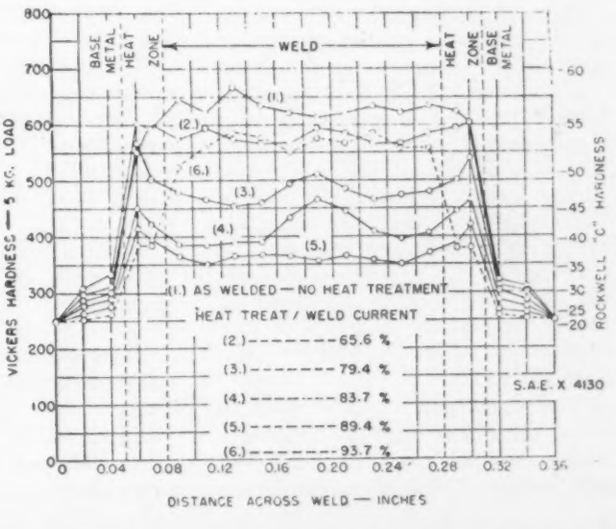


FIG. 2 — Hardness survey across the weld nugget for various heat-treat current values in terms of percentage of welding current corresponding to Fig. 1. Hardness is progressively reduced up to 89.4 per cent current value (Curve 5). When current value becomes excessive (93.7 per cent), the weld nugget rehardens (Curve 6).

o o o

ability of welds in NE 8630 composition was based on the general acceptability of similar welds in X4130 steels for aircraft use. This use of the comparative method of judging the new steel was necessary because there is at present no published or generally accepted standard of performance for weld metals in aircraft steels such as exists in the pressure vessel, piping and structural welding fields.

The authors stressed the need for such standards and gave a general outline of what factors should be included in these specifications. They pointed out that some welding rods regularly used for aircraft provide weld metal that does not meet the requirements of sound engineering design and they expressed the hope that the application of a suggested specification covering minimum tensile strength and bend elongation requirements would lead to a satisfactory balance between the physical properties of weld and base metal.

Arc Welded SAE 4130

Similar studies on the arc welding of SAE 4130 sheet and tubing at the Battelle Memorial Institute indicated that while many arc welding electrodes are useful and satisfactory for aircraft work and produce welds with acceptable physical and mechanical properties, additional improvements are desirable in the handling characteristics of all the electrodes. The handling characteristics of the electrodes were rated on the basis of factors such as ease of starting and smoothness of the arc, mobility of slag and weld metal, penetration and undercutting tendency, spatter, and on external characteristics of the deposited weld, including weld contour, surface pitting, and smoothness.

Data on the tensile strength and on the hardness of the welds and heat-affected parent metal were also obtained. These data, together with X-ray and Magnaflux inspections, served as a check on the other properties of the electrodes. In the case of one electrode with a high utility rating, for example, radiographs indicated considerable porosity in the groove welds, and the Magnaflux test disclosed a marked cracking tendency in the fillet welds, thereby nullifying the high rating.

The individual utility ratings were combined into a composite rating which indicated that the AWS class E6013 electrodes were most satisfactory, while those of the E6012 and E7012 classes were only slightly less so. Electrodes in class E6010 were appreciably less satisfactory. Among the alloy aircraft electrodes there was considerable variation in ratings and only one of the alloy electrodes was acceptable.

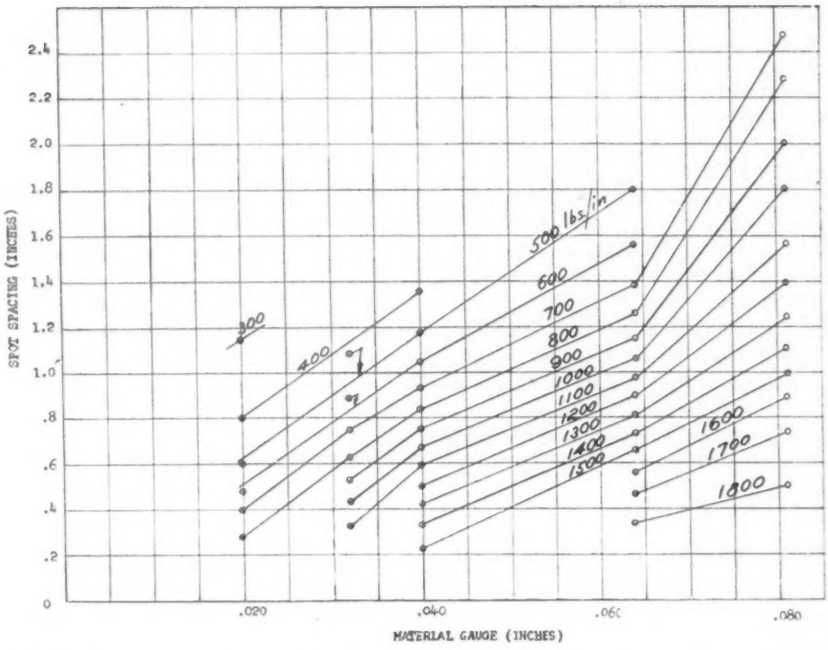


FIG. 3—Load carrying capacity in pounds per linear inch for five gages of 24ST Alclad spot welded at various spacings. These curves represent the averages of all values tested. Note that in every gage the strength of the joint increases markedly as the spot spacing decreases.

Distortion and Shrinkage Problems

Shipbuilders and construction forces have done much to improve control of welding to reduce distortion and to devise methods for correcting distortion, according to La Motte Grover, Air Reduction Sales Co., but wide variation in methods employed and in the effectiveness of these methods indicates the need for more engineering control and for practical research to provide a better basis for this control. Distortion is objectionable mostly because of appearance, but it can lead to technical difficulties resulting from eccentricities and to practical difficulties encountered in subsequent work.

Weld shrinkage, the cause of the major part of distortion, is often blamed for distortion resulting from other causes such as rolling mill stresses, rough handling and improper storage of materials, poor fit-up and fabrication errors, buckling under gravity loads or other external forces, changes of atmospheric temperature, over-shrinking in flame straightening and improper design and details.

The most important general precautions to be taken against welding distortion proposed by Mr. Grover are:

(1) Avoid over size welds and more welding than is required.

(2) Provide proper support for welded assemblies and devices to hold them straight or fair during welding, so that the shrinkage will largely be absorbed in the hot plastic metal.

(3) Distribute the heat of welding so that expansion or contraction will not be built up locally to so much higher a degree than in other parts of the assembly that the inherent stiffness of the assembly is not sufficient to resist the distortion forces.

(4) Use the size and type of electrodes, welding current, welding speed and other details of welding procedure that will result in least distortion for the thickness of material and local stiffness of the assembly involved.

The designer and detailer can do a great deal to facilitate distortion control by holding down the amount of specified welding to minimum requirements. Continuous welding usually involves a greater total amount of welding than intermittent welding and therefore causes more distortion.

Certain commonly used types of stiffeners and other details are very inadequate to resistant distortion. Structural arrangements involving stiffening of plating in only one direction can often be improved, at no additional over-all cost of construction, so as to resist distortion better and to function more efficiently as structural elements.

Sharp local kinks, bends and buckles frequently can be removed most effectively by cold straightening or by hot straightening, using jacks, saddles, strongbacks, rail benders, rolls, maul and flatter.

Most of the distortion caused by welding can be removed by flame straightening done with an oxy-acetylene torch, usually accompanied by a water spray, or air and water spray to speed up the work. This method has come into universal use in shipbuilding. A very common mistake made in flame straightening is to heat to too high a temperature and to heat more area than is necessary. When flame straightening is being used independent of mechanical means, nothing further is accomplished by heating beyond a temperature that will just barely begin to show a little color. Most users of flame straightening "over-shrink" by applying too much total heat. This overheating is wasteful and it causes secondary distortion often in other parts of a structure, which may not show up at once.

Accurate Plate Cutting

With the mechanically operated cutting torch playing an important part in the fabrication of shapes from steel plate, demands for greater accuracy have become increasingly common. The factors affecting the accuracy of machine cutting were discussed by Howard Hughey and A. H. Yoch, Air Reduction Sales Co. The degree of accuracy attainable is dependent upon many factors, but outstanding is that of relative location of plate and torch as affected by motion of the plate while cutting.

Plate motion is created by the expansive and contractive forces which occur, and the direction and extent of this motion with respect to the point of cutting will determine the final shape. A study of this motion disclosed that some of the common practices permit an erratic motion pattern and cause shifting of such magnitude as to seriously affect the accuracy. Where the motion can take place freely and the plate is not restricted, it was found that the magnitude of motion was halved and the pattern was uniform. The freedom of motion was gained by mounting the plate on its central section and by preventing the scrap and cut from coming in contact with the support.

While cooling created additional errors, the final examination disclosed that with plates mounted to give freedom of motion the inaccuracies were only 50 per cent of those produced with plates mounted on rough and irregular surfaces. Other factors also exist which affect the accuracy to some degree although no single factor appears to be as important as that of plate motion.

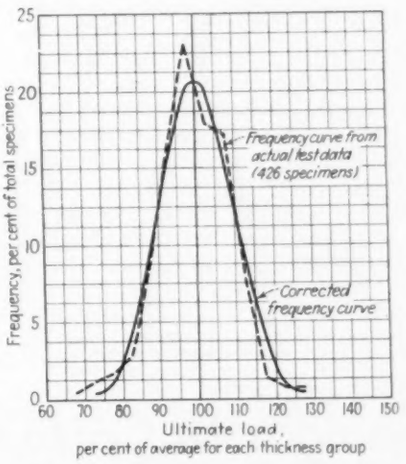


FIG. 4—Composite frequency curve showing the average consistency found in a total of 426 single spot shear specimens in five gages of 24ST Alclad. The corrected frequency curve represents the probable behavior for an infinite number of specimens, based on the actual frequency curve.

The design of the shape with respect to simplicity will assist in obtaining accuracy. The design of the machine, its workmanship, and capability of functioning accurately play an important part. Careful maintenance and proper use of the mechanical equipment must be practiced and proper relationship between the plate, torch and guiding device must be maintained.

The characteristics of the plate such as chemical analysis, surface condition, and heat treatment introduce factors also affecting the accuracy of cut. The chemical analysis will affect the specific setting of conditions for operation while the surface will affect the quality. Internal stresses resulting from heat treatment prior to cutting may develop shifting of the plate while making the cut.

By applying control to the factors which affect accuracy, results are being obtained which are equal in accuracy to that of any other metal working process, according to the authors.

Cast Iron Welding Rods

Although cast iron weld rods have been used for repair purposes for many years, the period of development of such rods for production work is just starting, according to R. J. Franklin, Chicago Hardware Foundry Co. New types of weld rod coatings have been developed for arc welding and for oxy-acetylene welding that hold considerable promise.

The presence of large quantities of graphite in the coating makes possible a higher temperature in the arc and molten metal, and the presence of large quantities of silicon slightly lowers the melting point with the combined result of an extremely fluid weld metal which compensates for the short time element and permits innoculation to occur. It is probable that the graphite plays the major role in innoculation and that the other metallic elements condition the weld metal by producing the necessary fluidity, thus permitting innoculation, by the graphite, to occur. Phosphorus has been found to be as equally effective as silicon and in every way comparable. Titanium is by far the most effective agent yet found, but it seems to be too sensitive at the fusion zone when welding certain low carbon low silicon types of iron. Copper will produce the desired characteristics but it too seems to be sensitive. These metals can be used alone or in combination with each other.

Of the other metals nickel seems to be more or less neutral in conditioning the metal although it can be used as an alloy. Chromium, vanadium, molybdenum and zirconium exhibit the same characteristics as when used in the cupola and when present in the proper quantities in the coating, and are definitely hardening and strengthening agents. Through their proper use, in combination with conditioning metals, cast iron deposits possessing a tensile strength of approximately 50,000 lb. per sq. in. have been produced that have been completely machinable with Brinell hardness around 275.

Thus, as graphitization in cast

iron electrodes can be controlled, and as most of the alloys can be introduced into the weld metal, it is possible to make electrodes that will produce specific physical properties just as has been done in steel and alloy steel electrodes. Practically any base iron can be used and its properties either reproduced, modified or emphasized as desired by adjustment in the composition of the coating.

Welding Steel Propeller Blades

Combining atomic hydrogen arc welding, Unionmelt automatic welding, gas welding and furnace brazing makes the Curtiss hollow steel propeller blade one of the trickiest welding jobs being performed in this country today. Its manufacture was completely described by C. A. Liedholm, chief metallurgist of the Curtiss Propeller Division, Curtiss-Wright Corp. The component parts are the camber or curved plate which is rolled up at one end to form the shank, and the thrust or flat plate. These two pieces first are joined together by atomic hydrogen welding by two operators working toward each other, after the parts have been preheated to 400 deg. F.

The blade outside shank seam is welded automatically by the Unionmelt process, after which the blade is stress relieved at 1200 deg. Unionmelt automatic welding is also used for welding the cuff retaining ring, but before this operation the shank is first heated inductively and then buried in mica flakes for a slow cool. After welding, the shank is again buried in mica flakes in a portable box while the piece is being transferred to the next welding jig. Here an inside seam weld about 30 in. long is made by the oxy-acetylene torch, which must be extended through the shank bore. Because of the confined space, this torch is water jacketed. The purpose of the inside seam weld is to fill out part of the gap which has not been reached by the outside seam weld and to smooth out the weld surfaces on the inside. For this gas weld, the preheating temperature must be high to promote smooth metal flow and prevent sooting. The blade is kept in a furnace during this operation.

An additional means of relieving stress concentrations is the brazing of a copper fillet on the inside of the blade edges on those parts of the blade interior that cannot be reached by the oxy-acetylene torch. This brazing is done simply by laying copper wires in the fillets and melting them down by passing the blades slowly between gas jets. Prior to brazing, the blades are stress relieved, shot blasted inside and out, pickled and fluxed. The blades are then heated in a muffle furnace and hardened. Final straightening is accomplished in conjunction with hardening in a die with an internally applied nitrogen gas pressure. The die hardens the thin sections of the blade, but the application of external quench water is required at the shank end. The blade must then be tempered at 1170 deg. F. to bring it to the desired hardness of Rockwell C26 to 33. The weld metal is slightly softer.

Burring and Polishing with Cotton Abrasive Wheels

A FREE cutting abrasive wheel that is resilient and flexible so that it combines high polishing action with light stock removal has been developed by the Carborundum Co., Niagara Falls, N. Y. Requiring little pressure, these wheels are made up of thin disks of cotton fibers impregnated with abrasive grains and bonded together or built up to form wheels of various diameters and thicknesses. The fibers are impregnated with uniformly grated Aloxite brand aluminum oxide or Carborundum brand silicon carbide. These wheels are made in grits 50, 80, 120, 180 and 320.

These so-called MX wheels are so fabricated as to give variable degrees of resiliency, flexibility and hardness. The wheels are made in six grades, numbered 1 to 6. The harder grades Nos. 1, 2 and 3 are recommended on work having a more severe dressing action on the wheel — such jobs as removing sharp burrs, breaking down edges of gears, etc. The wheels are designed to be used dry on any type of flexible shaft machine or electric hand grinder. They are mounted between relieved flanges and are dressed with an abrasive stick as required. Recommended operating speeds range from 6000 to 8000 surface ft. per min.

There is a decidedly wide application for these new wheels in the finishing and polishing of the out-of-the-way places on airplane engine parts and similar work. They are now being used for breaking down burrs or sharp edges on gear teeth, finishing and polishing spline grooves, finishing out depressed areas and undercuts, polishing internal diameters, and for smoothing down sharp edges of holes.

Chemistry at 1600° C

Abstract—1942 Campbell Memorial Lecture

By JOHN CHIPMAN
Massachusetts Institute of Technology

° ° °

IN the chemistry of 1600 deg. C the most important element is iron and the 91 other elements of the periodic table must be considered primarily with respect to this master element. Physically there is nothing particularly unique about liquid iron; many other metals resemble it rather closely. Those metals which are most similar to liquid iron mix with it readily to form liquid solutions or alloys which differ but slightly from liquid iron. Other metals which are less similar to iron mix with greater difficulty or not at all. For instance, silver, lead and bismuth are as different from iron as oil is different from water and are practically insoluble in liquid iron even at very high temperatures. Certain non-metals are soluble in liquid iron; for example, carbon, phosphorus and sulphur, while even the common gaseous elements, hydrogen and nitrogen, dissolve also to a limited extent.

Now the matter of solutions and solubilities is one of great importance to the chemistry of 1600 deg. Pure substances are indeed rare at this temperature and nearly every important chemical reaction is a reaction between dissolved substances in a solution or the transfer by diffusion from one solution to another. The term "solution" means exactly the same thing at 1600 deg. as at 25 deg., and the carbon or sulphur in liquid steel or the silica or iron oxide in liquid slag is just as truly in solution as the salt in sea water or the sugar in a well stirred cup of coffee.

The author discussed in detail the chemistry of liquid steel and the chemistry of liquid slag. The data which follow deal with reactions in the steel bath.

Once the nature and constitution of liquid steel and slag have been learned, the chemical reactions of steelmaking become as simple as the test-tube reactions of the old green-bound elementary chemistry. Not more than a third of the 92 known elements are of any interest at all in steelmaking but many of these appear in a very different form at 1600 deg. For example, the common gases include sulphur and phosphorus, zinc and cadmium, magnesium and calcium, while manganese is a volatile liquid evaporating as rapidly as water on a summer day.

JOHN CHIPMAN

1942 Edward de Mille Campbell memorial lecturer. Mr. Chipman is professor of metallurgy at Massachusetts Institute of Technology.

The familiar laws of the conservation of matter and of energy are as true at 1600 deg. as at ordinary temperatures but lest these fundamentals of chemistry have been forgotten, they could be restated in the language of 1600 deg. as follows: "What goes into the furnace must come out, unless it stays in." Applied to energy this is the substance of the first law of thermodynamics, and the author hopes to be able to show that the other laws of this useful science are equally simple and reasonable.

Every chemical reaction is accompanied by an energy change which may take the form of an absorption or evolution of heat. The amount of the energy change is measured in a calorimeter and the result is called the heat of the reaction. Chemists have devoted a great deal of effort to measuring these heats of reaction and every handbook of chemistry has a table of the heats of formation of compounds from their constituent elements. This table applies to reactions occurring at room temperature but it is not difficult, with the aid of the first law of thermodynamics, to obtain from it a similar table applicable at 1600 deg.

The high frequency induction furnace bears little resemblance to the precision calorimeters which are generally used in measuring heats of reaction, yet it contains some of the necessary elements of a calorimeter such as the control of initial temperature and automatic stirring of the calorimeter fluid. The development of the tungsten-molybdenum thermocouple for mea-

suring the temperature of liquid steel completes the necessary equipment. Practically all of the refinements of a precision calorimeter are lacking yet this simple outfit is capable of measuring the heat of solution of silicon in liquid iron within an accuracy of about ± 5 per cent. The procedure is equally simple. A bath of liquid iron of known weight is first deoxidized with silicon, then held at constant temperature for several minutes. A weighed amount of silicon is then added and the temperature rise is determined. Samples are taken before and after the addition to check the silicon recovery and the extent of deoxidation, if any. The results of seven measurements, which showed quite good agreement, were a heat evolution of 29,300 calories per mole (28 gm.) of silicon. By subtraction, therefore, the remaining distance is found to be —119,000 calories. This is the heat of the reaction of silicon in liquid steel with oxygen or iron oxide in liquid steel. It is very different from the heat of the reaction of solid silicon with gaseous oxygen which serves to illustrate how far astray it is possible to go by attempting to apply room-temperature data, uncorrected, to chemical reactions in the steel bath.

In the old textbook it was taught that some chemical reactions go to completion while others attain a state of equilibrium in which the effect of the reaction is exactly counterbalanced by that of the reverse reaction, the forward and backward rates being exactly equal. In the chemistry of 1600 deg. the occurrence of a reaction that is complete in the sense of using up the last trace of one of the reactants is very rare and we must focus our attention upon the equilibrium state as the principal limiting factor in any reaction.

It has been shown how the first law of thermodynamics helps to make understandable the energy changes in a reaction and the calculation of the heat of a reaction from other related heat effects. In the same way the second law of thermodynamics is especially useful in calculating conditions of equilibirum. This law has been the subject of so much misunderstanding among students of engineering, chemistry and metallurgy that the writer thinks it would be worth while at this point to restate it in terms that can be understood. If a scientific law is thought of as something immutably engraved on tablets of stone, it will be necessary first that this idea be discarded because the second law can be stated in the greatest variety of ways and it requires a lot of study to prove that they mean the same thing. The simplest statement the writer knows is: "Heat does not flow uphill." A statement which some chemical acquaintances appreciate is: "Any system left to itself will always go from bad to worse." The statement which is most useful in connection with chemical reaction is: "No reaction can occur in a direction away from equilibrium.' The significance is that the chemical forces which cause the occurrence of reactions are always striving toward an equilibrium condition and this condition is reached only when these forces have spent themselves. As an example, the reaction whose heat effect we have just calculated may be used, namely that of silicon and oxygen in liquid iron to form solid SiO_2. The second law tells that the equilibrium is the same whether it is reached by adding silicon to iron containing oxygen or oxygen to iron containing silicon or indeed by adding solid silica to iron containing neither. The actual composition of the liquid metal at equilibrium is governed by the "mass law" which may be regarded as a mathematical statement of the second law of thermodynamics. Applied to deoxidation with silicon the mass law gives the following equilibrium constant for the reaction

$$SiO_2 \text{ (solid)} = Si \text{ (in iron)} + 2O \text{ (in iron)}$$

$$K = \frac{{}^a\text{Si} \times {}^{a^2}\text{O}}{{}^a\text{SiO}_2}$$

The activity used here in the mass law equation is identical with that used in Raoult's Law and Henry's Law. So long as solid silica is present, the activity of SiO_2 is equal to one. Then for low percentages of silicon in contact with silica (as under acid slags) the constant simplifies to

$$K' = [\%\,\text{Si}] \times [\%\,\text{O}]^2$$

Numerical values of this constant have been obtained by determination of the silicon and oxygen contents of steel melted in silica crucibles, but before citing these values the writer wishes to introduce another thermodynamic relationship based upon the second law which shows how the equilibrium constant varies with temperature. It is called the vant Hoff equation and its simplest form is:

$$\log K = \frac{A}{T} + B.$$

Since A and B are nearly constant, a plot of the logarithm of K against the reciprocal of the absolute temperature should give a nearly straight line. The slope of the line, A, is related to the heat of the reaction by the formula:

$$A = -\Delta H/4.575.$$

What can we do with an equilibrium constant after it has been found? In the present case the oxygen content of an acid bath can be calculated as a function of its silicon and temperature; also the limit to which any bath can be deoxidized by silicon alone and the effect of temperature can be shown.

The control of phosphorus involves one of the most complicated reactions of steelmaking and it is fortunate for the industry that the practical solution of the problem did not have to wait for the theoretical metallurgist to catch up with the procession. It has been known for a long time that phosphorus removal depends upon the basicity and oxidizing power of the slag and many attempts have been made, without much success, to find the equilibrium constant of the reaction. Failure was not due to lack of effort or to absence of data, as witness the careful work of Maurer and Bischoff which led to an apparent equilibrium constant at 1600 deg. varying from 10^5 to 10^9. The difficulty lay in the complete ignorance of both the free lime content and the oxidizing power of the slag. These questions may now be reexamined in the light of the conclusions on the constitution of liquid slag and with the aid of metal oxygen analysis to determine its oxidizing power.

In Mr. Winkler's current work he writes the equation and its equilibrium constant as follows:

$$4\,\text{CaO (in slag)} + 2P \text{ (in Fe)} + 5O \text{ (in Fe)} = 4\,\text{CaO} \cdot \text{P}_2\text{O}_5 \text{ (in slag)}$$

$$K_P = \frac{(4\,\text{CaO} \cdot \text{P}_2\text{O}_5)}{(\text{CaO})^4 \cdot [\text{P}^2] \cdot [\text{O}]^5}$$

The free CaO depends upon the excess over that required by the acid oxides and upon the partial dissociation of the calcium silicate by the reaction:

$$4\,\text{CaO} \cdot \text{Si}_2\text{O}_4 = 2\,\text{CaO} + 2\,\text{CaO} \cdot \text{Si}_2\text{O}_4$$

$$K_D = \frac{(\text{CaO})^2\ (2\,\text{CaO} \cdot \text{Si}_2\text{O}_4)}{(4\,\text{CaO} \cdot \text{Si}_2\text{O}_4)}$$

To solve for both of these constants from a large compilation of

equilibrium data involves algebraic difficulties which Mr. Winkler has surmounted to obtain some interesting results. He finds that the dissociation constant is practically independent of temperature, having a value which is large enough to produce a very considerable amount of free lime in slags of 2:1 lime:silica ratio and some free lime even in slags of much lower basicity. The constant of the phosphorus equlibrium is extremely sensitive to temperature. Each point represents the composition of slag and metal which have been held in contact with each other at constant temperature more than half an hour and sampled while the temperature is measured by an immersion thermocouple. Each point represents a complete chemical analysis of slag and metal. The data represent a great variety of slags, some strongly basic, others on the acid side of orthosilicate and many of them containing all the components of open hearth slags, even including fluorspar. It is to be expected that when the influences of some of the minor constituents are better understood the deviation will decrease; yet it should be noted that the data are fairly concordant since the standard deviation corresponds to less than ± 15 deg. C in the temperature measurement.

The foregoing illustrations were selected as representative of steelmaking reactions that have been rather thoroughly studied. Others of equal importance have received less attention or perhaps involve greater difficulties of measurement; for example, when steel is deoxidized with aluminum, if any substantial amount of aluminum remains, the iron oxide content of the steel is reduced to so low an amount that it cannot be determined by any method now available. Yet this small amount of oxygen is vitally important in controlling the grain size and hardenability of the steel. How can it be found out how much is left? Other reactions require similar answers and wherever possible it is highly desirable that an answer be obtained by calculation so as to utilize whatever information is available. For example, manganese is removed from liquid steel by oxidation with iron ore. Why can't copper be removed in the same way? Or if not in this way, what other method can be invented for its removal? Or again, it is known that copper, nickel, molybdenum, tungsten and titanium form fairly stable sulphides. Are any of them capable of tying up the sulphur in steel in the same way that manganese does? What metals can denitrify steel and to what extent? Answers to such questions can be obtained by calculation and in many cases the answer is sufficiently definite to eliminate the necessity for experimentation. Let it be noted well, however, that chemistry is an experimental science and the calculations of such answers cannot be based on thin air. On the contrary such calculations must be based upon actual measurements of the properties of the substances involved in the reaction and the calculation itself is nothing more than the fitting together of known facts in such a way that an answer to the question will result.

The writer has shown you the equilibrium constant of a reaction varies with the temperature in accord with the vant Hoff equation

$$\log K = \frac{A}{T} + B$$

where the term A is the heat of the reaction divided by 4.575. Now if both the heat of the reaction and the constant B can be determined, the result will be the complete equation and we shall then have a value of K for any temperature selected, provided ΔH and B do not change. As a matter of fact, they are not strictly constant and this is the cause of 90 per cent of the troubles in making accurate thermodynamic calculations. But by the time 1600 deg. C is reached the variations become so small that if ΔH and B can be found at this temperature it is safe enough to use the equation over a range of say 1300 deg. to 1900 deg. C (or 2400 deg. to 3500 deg. F).

How then can a numerical value of the constant B be found for any given reaction? Perhaps the answer will be perfectly clear when it is stated that B is related to the entropy in exactly the same way that A is related to the heat of the reaction. If ΔS is the increase in entropy in the reaction, then $B = \Delta S/4.575$.

A few years ago the writer would have been afraid to mention entropy in a metallurgical gathering for fear that some of the gray-bearded elders who had entered through the side door of mechanical engineering might take a pot shot to bring him down to earth. Engineers can be divided into three classes: those who know all about entropy, those who use it anyhow, and those happy and carefree souls into whose lives it never intrudes. Most metallurgists belong to this third group and the writer asks their indulgence while he makes a few remarks to fellow members of group two.

It appears that entropy is a property which all substances have by virtue of the motions and vibrations and relative positions of their constituent molecules. These motions and vibrations become more violent the higher the temperature and their energy is the product of temperature times entropy, TS. By measuring the energy input required to raise the temperature, that is the heat capacity or specific heat, it can be found how the entropy increases from one temperature to another. It is thus possible to find B in the equation at high temperatures if there was one starting place where the entropy was known. And this is where the third law of thermodynamics steps in to show us that the absolute zero of temperature is in fact such a starting place.

Learned scientists still argue the best statement of the third law, but the one which the writer prefers is a definition of the absolute zero of temperature quoted from an examination paper in freshman chemistry: "The absolute zero is the place where all the molecules lie down and cease to wiggle." This gives a starting point from which, when sufficient data are available, the entropy of every substance at any temperature can be calculated, and by addition and subtraction the value of ΔS of all reactions in which there is interest.

The compilation of tables of the heats and entropies of the reactions of steelmaking has made rather fitful progress during the past few years. Such tables can never be fully satisfying either from the viewpoint of accuracy or of completeness, and those dealt with are to be regarded as representing only the present transition state of the knowledge of the chemistry of 1600 deg. In them the followers of Professor Campbell will be able to find answers to such questions as: "Will this reaction occur or will it not?" How can this desired reaction be brought more nearly to completion?" "Why does this process operate while that one does not?"

Centralized Oil Distribution

. . . Streamlined oil handling equipment at Republic's Gary plant has improved machine maintenance and cut oil consumption and container handling cost. Four additional similar systems underway.

A NEW oil distribution system recently completed at the Gary plant of the Union Drawn Steel Division of Republic Steel Corp. has improved machine maintenance and cut oil consumption and container handling cost to such an extent that plans are already underway for similar installations at four other plants of the company. Altogether, eight different petroleum products are pumped in separate pipe lines to individual machines and points of use throughout the plant which produces bars, wire, precision shafting and special shapes of cold finished steel. This piping system is shown in Fig. 1.

Turbine oil, kerosene, cylinder oil, Polarine oil, soluble oil, drawing oil, and light and heavy slushing oil are handled in this fashion.

The soluble oil is used as a coolant for metal saws, lathes, and grinders. The drawing oil is required for lubricating the dies used in cold drawing bars. The two grades of slushing oil are used for spraying a protective film on finished stock as it is loaded into railroad cars on the long depressed siding which runs into the plant shipping department.

Delivered to the plant by truck, each grade of oil is allowed to flow by gravity into its individual storage tank in a ventilated underground vault through 2-in. filling pipes brought up inside an accessible concrete enclosure beside the plant building.

Weather-proof hinged covers on each oil line and locks on the sheet steel cover of the enclosure, as shown in Fig. 2, provide effective protection against fire, theft, or other hazards.

The storage vault, Fig. 3, houses eleven 280-gal. tanks, installed vertically side by side, and a twelfth, also of 280-gal. total capacity, divided into three sections of equal size and mounted horizontally on a tank saddle of all-welded steel construction.

Such large quantities of slushing oil are consumed that eight of the vertical tanks, connected together in batteries of four tanks each, have been provided to handle the hundreds of gallons of the two grades used per month.

Turbine oil, drawing oil, and soluble oil are each provided with separate storage tanks. Consumption of Polarine, kerosene and cylinder oil is in each case enough smaller that adequate reserves can be handled by allocating to each a section of the three section tanks.

Gear pumps, equipped with relief valves on the pump heads, are used on all eight oil lines fanning out from the central storage vault. They are driven by explosion-proof three phase, 220 volt, 60 cycle motors. On the soluble oil installation and on the drawing oil installation, where an interruption

FIG. 2—Eight oil receiving lines are enclosed in this steel and concrete compartment for protection against fire, theft and other hazards.

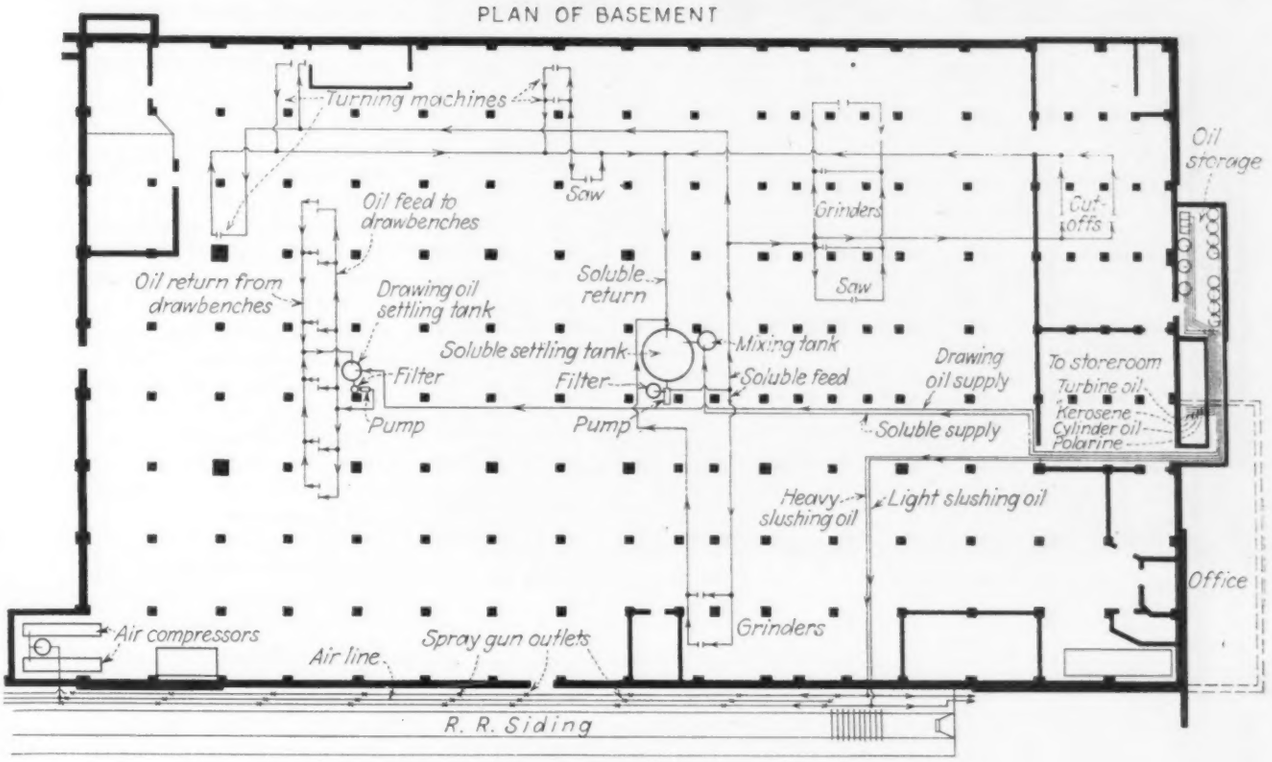


Fig. 1—Oil distribution system handles eight different petroleum products.

to supply would seriously inconvenience plant operations, two such pumps, one a standby, have been installed on each set of storage tanks.

In addition to the ordinary control switches on the motor circuits, mercoid switches have been installed on the slushing oil and pump handling the light and on the main and standby pumps for the soluble oil to take care of the situation created by a tendency of these oils to leak past the diaphragms of ordinary pressure switches and render them imperative. Motor starter switches and pressure gages have been grouped together on the wall immediately outside the storage vault as shown in Fig. 4.

Ventilation of the storage vault is provided by the installation of 4-in. pipe sections at both ends of the room which exhaust to the outside atmosphere.

One vent line extends down to within four in. of the floor; the other opens directly above the tanks at the ceiling level. Between the two it is possible to avoid a dangerous accumulation of fumes at any level.

From the centralized storage room iron pipe lines, carried close to the basement ceiling, and of varying sizes depending on the viscosity of the oil handled and the length of travel involved, carry the different oils to four principal points in the plant: (1) The store room, (2) the shipping department, and to settling tanks for separate (3) drawing oil and (4) soluble oil distribution systems.

All oil lines pass from the underground storage vault through a short insulated tunnel provided with steam heating coils to insure the maintenance of at least 70 deg. F. temperature, even when outside temperatures fall as low as zero. This tunnel carries the pipe lines into the main section of the plant basement.

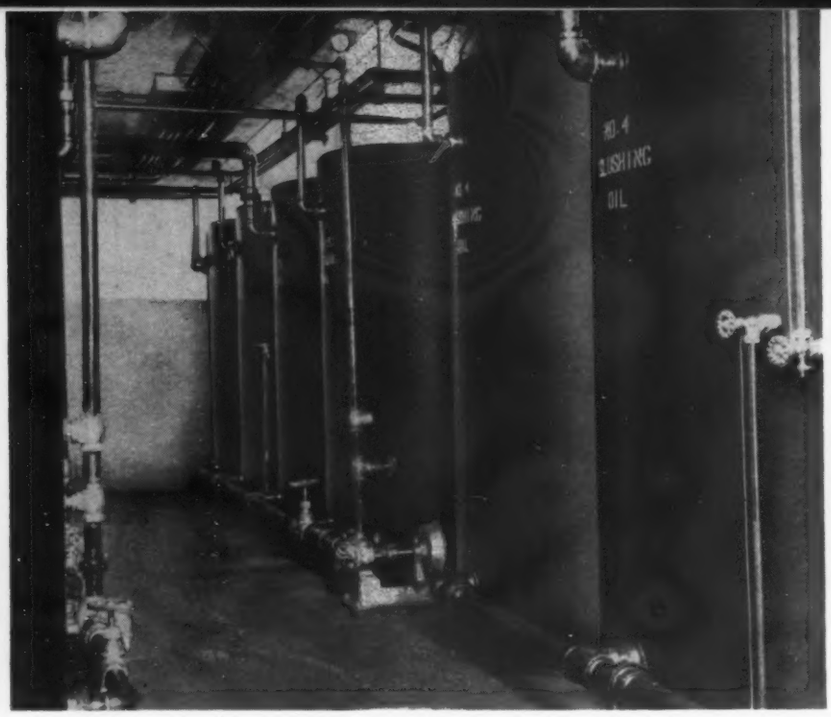
Four lines carry turbine oil, kerosene, cylinder oil and Polarine oil to the store room where they are dispensed in small quantities as shown in Fig. 5. Kerosene and Polarine are pumped under 20 lb. pressure. This is increased to 40 lb. for the turbine oil and to 60 lb. for the cylinder oil. For identification these pipes are painted as follows:

Turbine oil—yellow
Kerosene—red
Cylinder oil—blue
Polarine oil—aluminum

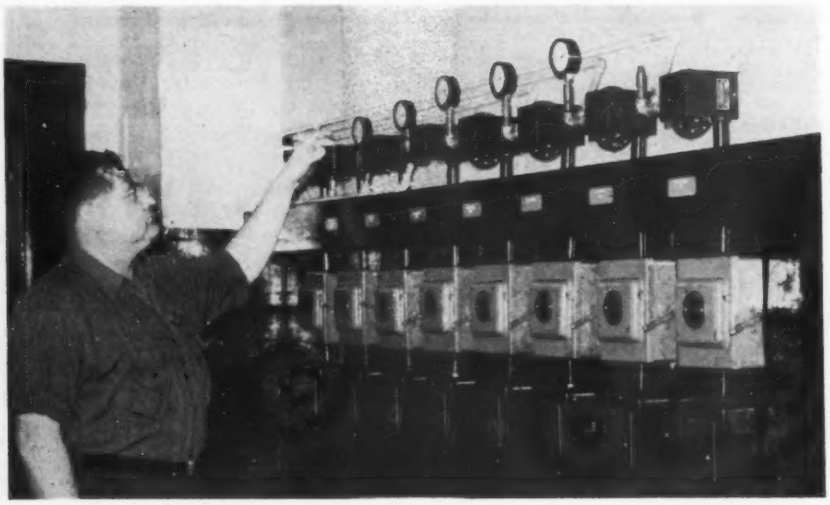
The slushing oils are delivered to the shipping department through 400-ft. supply lines from the storage room and carried along the depressed railroad loading bay, shown in Fig. 6, in two separate lines. One-in. pipe, painted brown, is used to deliver the heavy slushing oil under 80 lb. pressure; ¾-in. pipe painted black handles the light slushing oil at from 20 to 40 lb. pressure. A 1¼-in. line (gray) carries air under 20 lb. pressure from air compressors located at the other end of the shipping department and parallels the two oil lines for over 200 ft. along the track.

Eleven stations are provided along the track loading zone where spray gun equipment on 25-ft. lengths of hose can be attached to either oil line and the finished steel sprayed as it is loaded into the railroad cars, Fig. 7. Oil and air outlets, Fig. 8, have been equipped with fast coupling connectors, consisting of a socket and plug, to speed attaching and removing the spray units.

Inasmuch as some finished steel is shipped by truck from the plant, a portable slushing outfit, shown in Fig. 9, has also been provided. It consists of a small, mobile unit on which is mounted small, self-contained pumping and air compressor equipment. Separate 54-gal. drums, are provided to carry either light or heavy slushing oil which is sprayed from this portable



o o o



o o o

equipment under 32 lb. air pressure.

Soluble Oil Distribution

Lathes, grinders, cut-offs, and saws require a quantity of soluble oil in their operation. To provide it, a self-contained and self-cleaning distribution system has been set up with supply and return lines to handle the soluble oil to and from all equipment of this nature in the plant.

Heart of the system, as shown in Fig. 10, is a 12-ft. diameter, open settling tank in the basement of the plant. The soluble oil is pumped from storage through 178 ft. of 1¼-in. pipe to a small measuring tank immediately adjacent to and elvated above the settling tank. It is mixed for use as a coolant in proportions of 10:1 with water which is introduced into the settling tank directly from a plant water main. From the settling tank the coolant is pumped under 40-lb. pressure through a self-cleaning coolant filter to the machines on the floor above. It returns by gravity to the settling tank.

The abrasive particles which are picked up in the coolant oil would produce excessive wear on a gear pump, and consequently a centrifugal pump is used for this assignment. The pump has a capacity of 225 gal. per min. and is driven by a 10 hp., 220 volt, 60 cycle, three phase, explosion-proof motor.

The two cylindrical filtering units contained in the coolant filter are connected through gearing to a motor-driven, speed-reduction unit. They turn only when cleaning is necessary and then at 6 r.p.m., thereby minimizing power consumption and wear and tear on equipment. The driving motor is controlled by a differential pres-

---

ABOVE LEFT

FIG. 3—A group of 280-gal. tanks in an underground vault are used for the storage of eight different kinds of oil used in plant processes.

o o o

CENTER

FIG. 4—Motor starter switches and pressure gages are grouped together on the wall outside the storage vault.

o o o

AT BOTTOM

FIG. 5—Turbine oil, kerosene, cylinder oil and Polarine are dispensed in small quantities from these lines brought to the stock room from the underground storage vault.

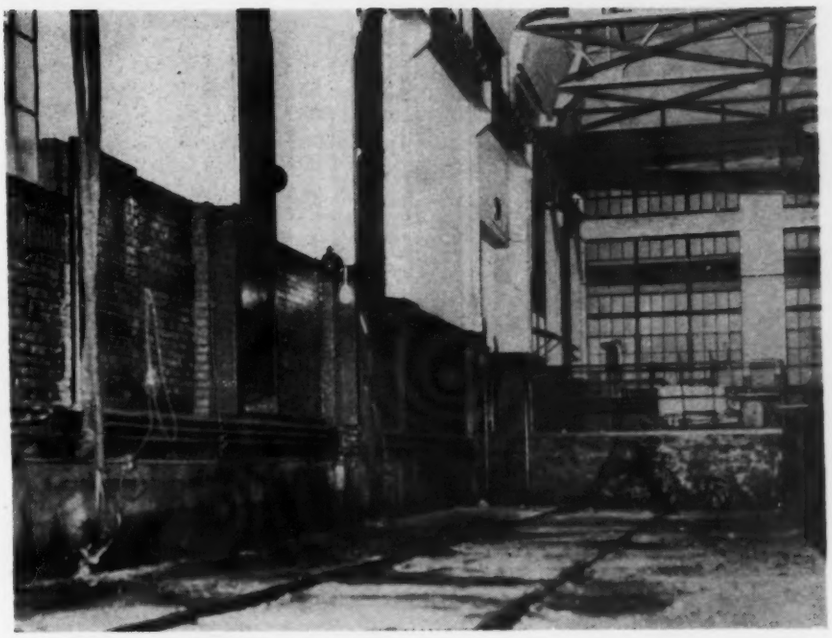
sure switch which operates only when the differential pressure increases to a predetermined point. When the filtering units are cleaned, which usually requires only a fraction of a turn, the differential pressure drops and the motor is stopped. A manually-operated switch is also provided to permit the motor to be started and stopped at will.

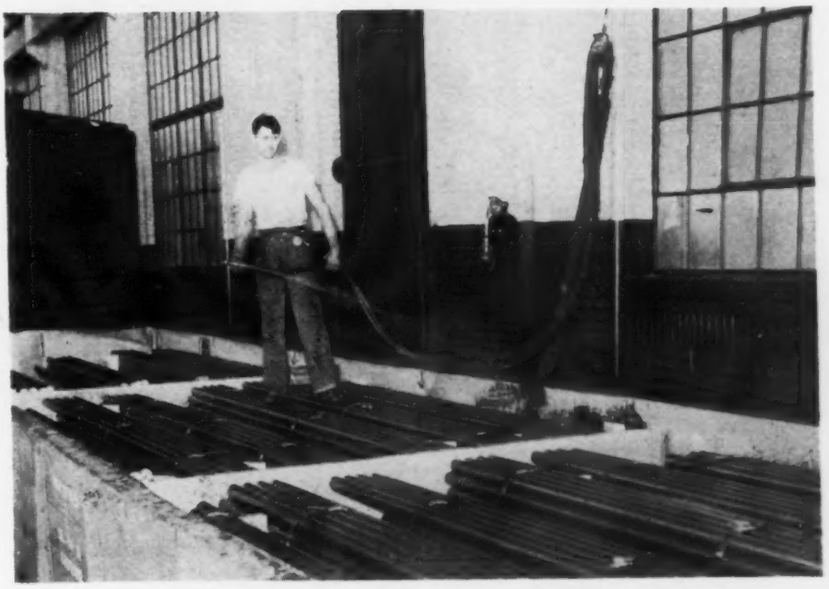
An exceptionally large sump is provided below the filtering units to permit lower filtration cycles without necessity of shut-downs for cleaning. The discharge line from the filter has been provided with a 3-in. relief valve, 10 to 300 lb. pressure range. This has been set at 45 lb. pressure and is connected so that it can by-pass oil into the return line to the settling tank. Maximum capacity of the filter is 400 gal. per min.

At each machine, whether grinder or lathe, there has been installed a primary settling basin, Fig. 11, to remove as many as possible of the metal particles, chips, etc., which would otherwise be returned through the piping to the main settling tank.

The carborundum bonding cement or sizing used in the composition of grinder wheels, for example, would quickly stop up even a good-sized pipe if permitted to pass through in any quantity. The individual settling basins at each machine, therefore, consist of a wire basket, as shown in Fig. 12, suspended in a sheet metal basin. The coolant is discharged from the machine into the metal basket which holds back most if not all of the objectionable foreign matter from entering the return line to the settling tank.

At all junction points in the re-





ABOVE RIGHT

FIG. 6—Air, under 20 lb. pressure, and two oil lines, one carrying heavy slushing oil, the other light slushing oil, parallel the length of the railroad loading zone inside the plant shipping department.

o o o

CENTER

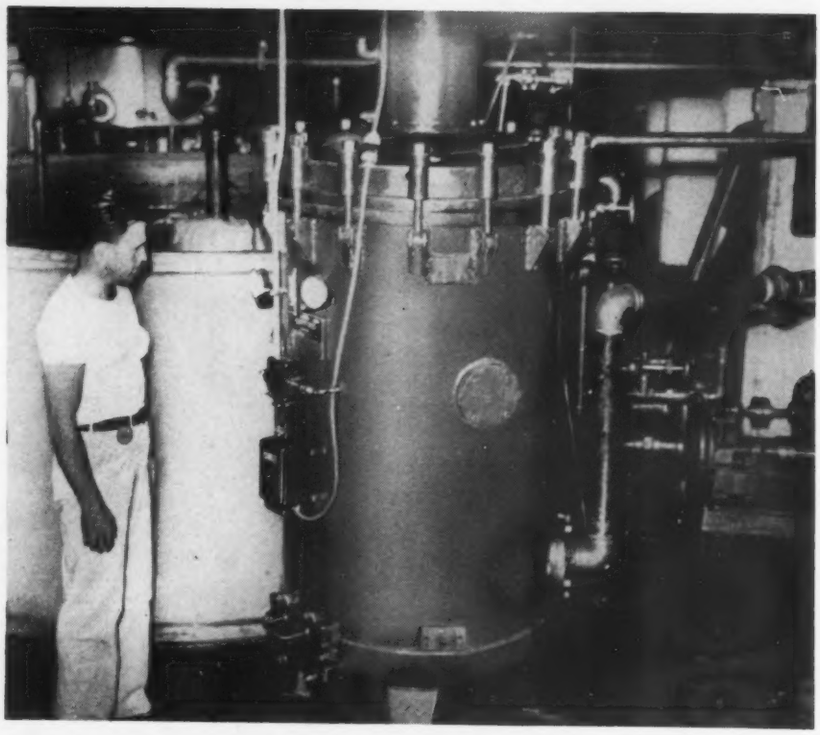
FIG. 7—Regulation spray gun equipment on 25-ft. lengths of hose is used for spraying finished steel with slushing oil.

o o o

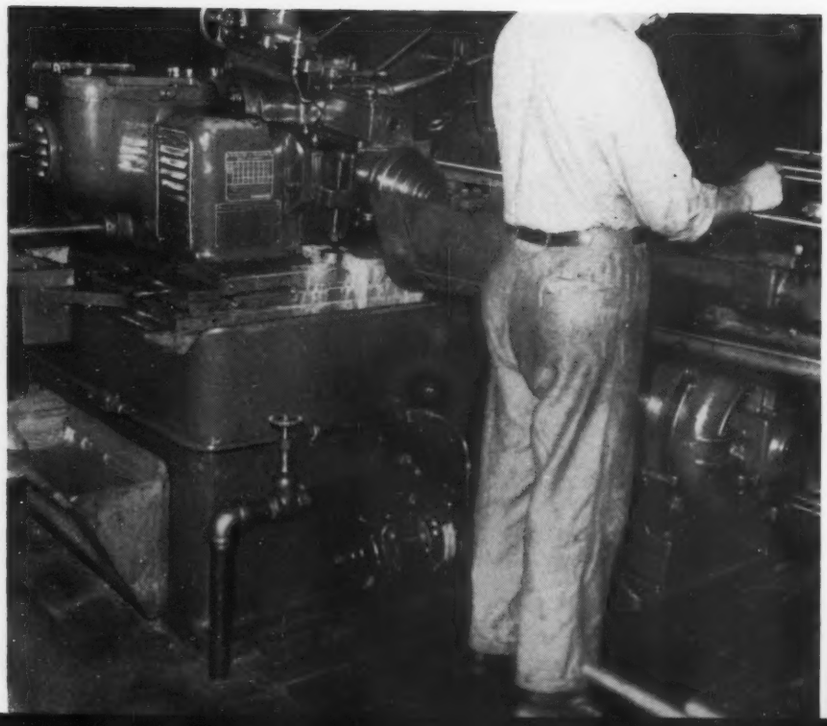
AT BOTTOM

FIG. 8—Oil and air outlets are equipped with fast coupling connectors to speed attaching and removing the spray units.

o o o



o o o



turn lines from these basins, 45-deg. Y bends in the direction of flow, Fig. 13, are used to minimize further any possible clogging of the lines. Likewise, all return lines have a minimum number of bends and fittings and have been kept as nearly as possible in a straight line.

At the settling tank the return line empties into a screen basket of 100 x 100 mesh, welded to and reinforced on the outside by a perforated shell having 1-in. holes on 11/16 in. centers or the equivalent of 48 per cent open area. Sixteen inches in diameter and 3 ft. in overall depth, this basket arrangement permits the oil to dissipate its initial turbulence before overflowing into the settling tank proper.

So that the settling tank can be cleaned at frequent intervals, yet without interrupting operations, the bottom has been divided into three sections by baffles 3 ft. high. Since the depth of the coolant in the tank is generally carried at about 30 in., this permits discharging the returning coolant into one section of the tank while cleaning another.

The longest and most extensive of the oil circulating arrangements in the plant, the delivery side for the soluble oil involves 680 ft. of pipe, graduated in size from ¾-in. to 3-in. On the return side, 630 ft. of pipe from 1 to 4 in. in size have been used. For identification all soluble oil lines are painted white.

Drawing Oil Distribution

Basically the same elements are required in the distribution system handling the drawing oil as are needed for the distribution of the soluble oil. The character of

---

ABOVE LEFT

FIG. 9—Finished steel to be shipped by truck is sprayed with slushing oil from a portable unit, equipped with air compressor equipment.

o o o

CENTER

FIG. 10—Five feet high and 12-ft. in diameter, this large open settling tank in the basement of the plant is the heart of the soluble oil distribution system.

o o o

AT BOTTOM

FIG. 11—At each grinder and lathe, primary settling basins similar to this have been installed to catch as much of the metal chips as possible.

foreign matter picked up in the oil, however, has made some innovations necessary to insure the proper functioning of the system which consists of three sections:

(1) 260 ft. of 1-in. make-up line from oil storage vault to two settling tanks,

(2) 130 ft. of supply line, divided almost equally between 1-in. and ¾-in. pipe, which delivers the oil to the drawbenches, and

(3) a 125-ft. return line, much of it 1½-in. pipe, the balance 1-in., which deposits the drawing oil in either one of two settling tanks in the plant basement.

All piping for identification is painted green.

The number of machines to be served and the length of travel of the drawing oil are much less than in the soluble oil set-up. At the same time the quantity of oil to be kept in circulation is sizable and it has been found convenient to use two settling tanks, rather than one to facilitate cleaning operations, as shown in Fig. 14. While one tank is being used the other can be cleaned. A gear pump of 10 gal. per min. capacity, is equipped with a relief valve on the head and driven by a 1 hp., 220 volt, three phase, 60 cycle, explosion-proof motor. It operates continuously to maintain the oil pressure at approximately 40 lb. pressure. The relief valve on the head of the pump has been found sufficient to hold the oil pressure steady at this value.

The discharge line from the pump passes all the oil through a pressure liquid type filter using an absorbent type of filter cartridge. However, steel wool has been substituted as the filtering medium in place of the usual cotton waste, wool, excelsior, or asbestos.

Steel bars in the manufacturing process are pickled to remove scale, then dipped into wash water to remove acid. From the wash water they are put through a lime solution at 220 deg. F. This leaves a fine coat of lime deposit on the bars which, picked up in the drawing oil, was found to fill up a cotton waste filter very quickly. No. 3 steel wool was substituted as a filtering medium and has been found to be more satisfactory. While the steel wool permits the lime particles to pass through, this is entirely satisfactory since lime is in itself a lubricant and need not be removed from the oil as it does not damage the drawing dies,

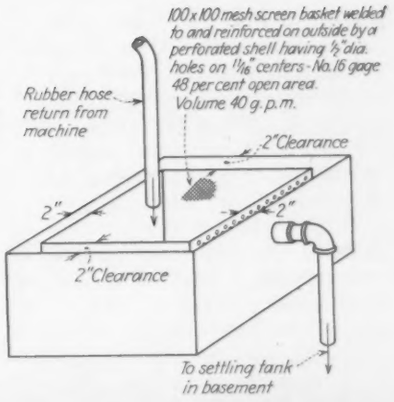
RIGHT

FIG. 12—Settling basin for grinders and turning machines.

o o o

BELOW

FIG. 13—To minimize clogging of return lines, 45-deg. Y bends are used in the direction of return pipe lines.


100 x 100 mesh screen basket welded to and reinforced on outside by a perforated shell having ½" dia. holes on 1⅛" centers - No. 16 gage. 48 per cent open area. Volume 40 g. p.m.
Rubber hose return from machine
2" Clearance
2"
2"
2" Clearance
To settling tank in basement

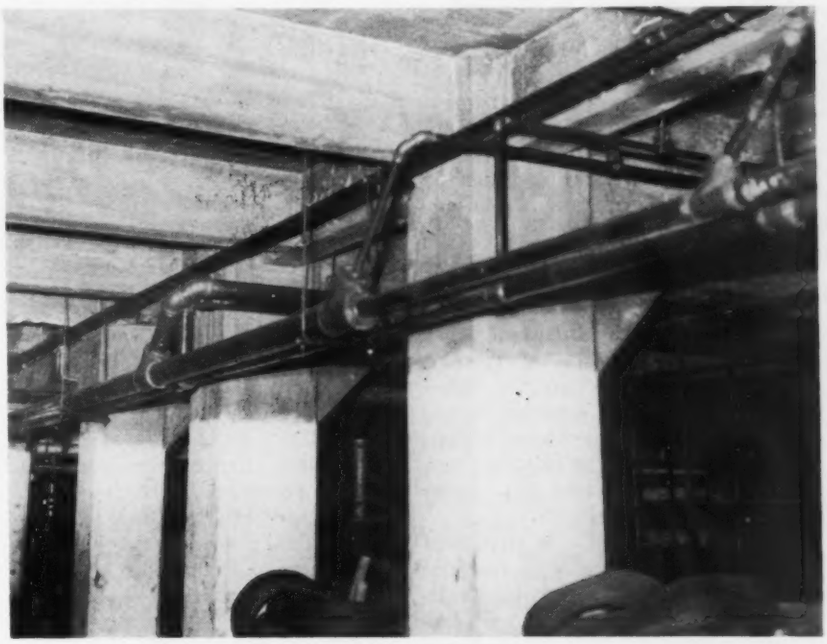


FIG. 14—Two settling tanks are used to facilitate the cleaning of the drawing oil. Piping equipment has been installed in a manner so that it can be swung into position over the second tank while the first is being cleaned.

shown in Fig. 15, in any way. As in the piping circuit for the soluble oil distribution, the discharge line from the drawing oil filter is equipped with a 1-in. relief valve, 10 to 300 lb. pressure range, and by-passes into the return line to the two settling tanks.

All of the oil distribution circuits in the new system have been functioning most satisfactorily from their inception a few months ago. The centralizing of all oil handling has introduced a number of advantages over and above the obvious ones. This is particularly true in connection with the distribution of soluble oil. Previously soluble oil was distributed around the plant in individual barrels. Used as a coolant for the metal saws, lathes, and grinders, the oil was mixed with water as needed. Any one of several individuals handled these mixing operations with the result that the supply varied widely in consistency and was frequently not so satisfactorily proportioned as was wanted. Distributing the soluble oil from a centralized system, on the other hand, has made it possible to put the mixing into the hands of one man. This makes for absolute uniformity of results and for proper consistency at all times.

The establishment of a large central reservoir of soluble oil has also eliminated one of the problems always present with small self-contained systems. The many times larger quantity of soluble oil in circulation in the new system gives the oil a chance to cool off before being returned to the machines. In the small self-contained systems of individual machines there is always a chance of the coolant getting too hot and permitting the tools, the machine, or the work itself to be damaged through the development of excessive temperatures.

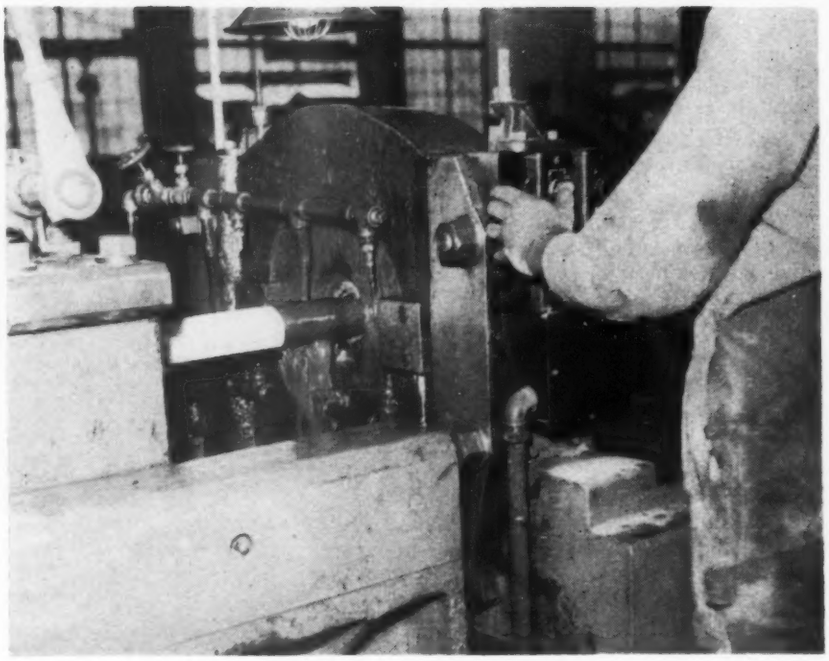


FIG. 15—An unfailing supply of drawing oil at all times is necessary in cold drawing. Draw benches, such as shown here, are used for drawing as many as three bars at a time.

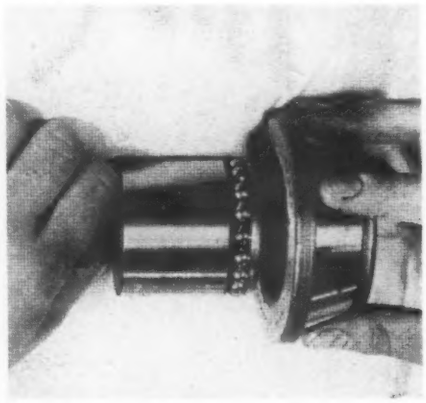
Likewise, with centralized control of the supplies of coolant and drawing oils, the pressure at which these oils are delivered to the point of use can be kept more uniform. Generally, too, the oils as they are returned to service are much cleaner than would be possible if they were handled in any other way.

Anti-Friction Plug Gage

BRITISH TIMKEN, Ltd., who use plug gages extensively, have developed a new form of plug gage which they claim overcomes the usual difficulties of jamming, increases both rate and accuracy of inspection and permits working to closer tolerances.

With conventional "Go" and "Not Go" plug gages, if a piece is undersized, the operator will probably make several attempts to insert the gage before finding out that the piece is actually a reject. Conversely, a correct piece may be rejected by reason of the operator persisting in a misalined approach, and subsequently scrapped.

The gage embodies anti-friction bearing principles, a ring of balls guiding it into the hole. The balls are free to rotate in any direction and so effect immediate lining up of gage and work. The gage can be held lightly and inserted easily in the work, even though the gage diameter exactly equals that of the hole. Increased production results from simplicity and ease in operation by unskilled labor, allowing more work to be gaged in a given time with no lisk of jamming and consequent time loss, while there are fewer rejects as a result of the gage passing the minimum hole.



In addition, this new plug has a longer life than the old type in general use. The gage does not jam, nor does it become ineffective through end wear or "knocking up." The positive alinement avoids damage to the work by "picking up," a decided disadvantage of the conventional type plug. The longer life means lower costs on gage replacements. The new plug gage will be known as the Emmerton gage. It has been provisionelly patented in England.

Tool Engineers Discuss War Production

. . . Some of the topics covered in a crowded two-day program at Springfield, Mass.: Training women workers, ordnance inspection methods, glass fixed gages, NE steels, reamers with plastic bodies, plastics with high impact strength, tool conservation, solid carbide burrs, chromium plated lathe tools, plastic jigs, subcontracting problems.

° ° °

PROBLEMS of training, inspection, tool and material conservation and substitutions, subcontracting and special war tooling problems were discussed in two days of crowded sessions of the War Production Conference of the American Society of Tool Engineers, held at Springfield, Mass., Oct. 16 and 17. Over 800 members of the society attended the conference.

Sessions began on Friday morning and ended with a banquet on Saturday night at which Thomas H. Beck, president, Crowell-Collier Publishing Co., was the principal speaker. Mr. Beck proved that his own company was in the tool business by exhibiting some chromium plated lathe tools developed at the printing plant of his company as an outgrowth of research work on chromium plated "doctor" blades used in printing presses. Greatly increased life between grinds is claimed for the lathe tools, which are plated by a special process, which over 400 manufacturers have been licensed to use without royalty. No nickel nor copper underplate is used, nor metallic cathodes.

At the banquet, Otto W. Winter, president of the A.S.T.E., issued charters to two new chapters, one at Windsor, Ont., and the other at Fairfield County (Bridgeport) Conn., bringing the total to 55, with over 11,000 members. Mr. Winter considers the job of tooling plants for war production only at the end of the "first half of the first inning." He believes that constant improvements in tooling, production methods and in design will be made throughout the conflict. After the war, tool engineers will be kept busy for many years retooling factories for the production of peacetime goods.

Frank W. Curtis, chief engineer, milling machines, Van Norman Machine Tool Co., Springfield, who acted as general chairman of the conference, was presented with a life membership certificate by Mr. Winter in recognition of his work as past president of the society.

Training Problems

At the session on training, Thomas O. Armstrong, industrial relations manager of the Springfield plant of Westinghouse Electric & Mfg. Co., indicated that although pre-employment training in school was highly desirable, a drop of 40 per cent in enrollment in short term trade school courses in September proved that the demand for trainees was so great that plants in the Springfield area were by-passing the schools in order to get people to work faster. Most plants are not equipped to set up vestibule schools and hence ordinarily depend upon the schools to give what the speaker termed orientation courses prior to entering industry. However, 95 per cent of specific machine operation training must be given on the job, he maintained.

Mr. Armstrong predicted that by next year, 80 per cent of those employed in defense industries would be women. It is particularly important to get women properly oriented on the job so as to remove the unconscious fear of the machine, he said. Most women quit, if at all, during the first week of employment chiefly because they fear they are failing on the job. Hence pains should be taken to see that encouragement is given during the initial training period.

Charles C. Gorham, supervisor of training, Greenfield Tap & Die Corp., considers the vestibule school the logical solution to industrial training, especially for women. The courses in such schools can be adjusted to the specific needs of each particular plant. Both speakers agreed that the choice of job instructors was most important, and Mr. Armstrong particularly recommended that these plant instructors be given the 10-hr. "Job Instructor Training Course" sponsored all over the country by the Training-Within-Industry group of the Manpower Commission. Already over 35,000 supervisors have taken this course and have been certified as job instructors.

Industry's greatest competitor for manpower is the armed forces, both for shop workers and technical men, Mr. Armstrong said. He

cited, for example, the need for 1560 master mechanics out of every 300,000 men inducted into the army. So far the army is getting only 14 per 300,000. Another speaker on the same program, S. J. Hoexter, of the U. S. Office of Education, on the other hand, pointed out that out of every six engineering college graduates, the army and navy are getting four and industry two, whereas he maintained that industry requires five out of every six graduates. He also stressed the necessity of more technical subjects in high school curricula so as to serve as pre-induction training for technicians for the army. Many cultural subjects will have to be dropped if this need is to be met. Mr. Hoexter asked the society members to cooperate with the colleges in setting up courses in tool engineering.

Women in Industry

Speaking of "Women in Industry," Arnold Thompson, chief tool engineer, National Steel Car Corp., Ltd., Malton, Ont., pointed out that attention must be paid to five factors if female labor turnover is to be kept low: Personal welfare, transportation, recreational facilities, housing and some means for caring for young children of mothers who work. One small arms plant in Toronto, employing 4000 women, has housing facilities for 1000 of them, thus enabling them to draw upon outside communities for help. A completely self-contained community has been set up, including a recreational hall, beauty parlor and adequate dormitories.

Mr. Thompson considers trade school training of women more detrimental than useful and places his chief reliance on factory training at the machine. "Young, single and untrained women" he considered most desirable for employment. Recent high school graduates are most adaptable. Girls 20 to 24 years of age who have never had to work before make excellent war workers, too. Women work well alongside of men as comrades, but it is necessary to select the right type of men to work with them. "Women do not wish to be courted by men while at work," the speaker said.

Glass Gages

At the session on inspection, Col. H. B. Hambleton, Office of the Chief of Ordnance, revealed that within the last month the Ordnance Department has been experimenting with fixed gages, like plug and ring gages, made of glass. Such gages are not too fragile and can be ground as accurately as steel gages. A "Go" and "Not Go" plug gage he exhibited had been made by a glass candlestick maker. Rejected optical "crown" glass can also be used for this purpose. Although no present source of supply was mentioned by the speaker, he indicated that within a month or two further details would be available through the industrial magazines.

OTTO W. WINTER
National president, American Society of Tool Engineers.

Colonel Hambleton paid tribute to the gage industry for the help given the Ordnance Department in building up the industry to meet the tremendous demands of the war program. The need for much greater gage capacity was foreseen in 1940 when the industry, which was then turning out about $4 million worth of products a year was quadrupled. Since then there have been four other expansion programs involving an expenditure of $20 million for new facilities in about 100 gage shops. Present annual capacity is about $125 million and this will be stepped up to $175 million by next spring, the speaker said.

For a complete explanation of the new Ordnance Department policy on gage makers' tolerances and wear allowances on fixed gages, the colonel referred his audience to the article, "Foolproof Gaging System," which appeared in the Sept. 3 issue of THE IRON AGE (now available in reprint form, 15c.). He also called attention to the widespread use of multi-contact electric gages for inspecting a number of diameters at once on ordnance items like shells and cartridge cases. The use of these visual indicator gages has greatly reduced the number of inspectors required.

Henry J. Richards, chief inspector, supercharger plant, General Electric Co., who presided at the inspection session, emphasized that the end use of each product should be kept in mind when tolerances are set on components. Close tolerances, he said, are often set by people who do not realize the costs necessary to attain such tolerances, which are often not needed. The tolerance on each dimension should be as liberal as possible and yet secure the proper functioning of the mating parts.

Some of the special gages used in small arms manufacture were illustrated by Carlton G. Nelson, quality engineer, Colt's Patent Fire Arms Mfg. Co. Many special gages are used in this plant to check alinement on vital parts on subassemblies, like the relation of the primer hole to the firing pin.

"Not Go" Threads Acceptable

In the discussion, much attention was given to thread gaging. To the surprise of many, Colonel Hambleton indicated that the Ordnance Department will accept threaded parts in which the "Not Go" gage will enter the full length of the gage without perceptible play or shake. This holds for both male and female threads. This ruling is in accordance with a recommendation given in the National Bureau of Standards Handbook H28 on Screw Thread Standards for Federal Services, 1942. So far, however, neither the Navy nor the Air Forces has accepted this interpretation of an acceptable thread.

Molybdenum Tight

In sesions devoted to the topics of tool conservation and materials substitution, it was brought out that of all the alloying elements molybdenum is the most out of balance at the present time. This is due to the fact that both in high speed steels and in the new National Emergency steels, resort was made to molybdenum as a substitute not only for tungsten but also for nickel and chromium on the basis that we then had an "inexhaustible" domestic supply of

FRANK W. CURTIS

Past president of the A.S.T.E. and general chairman of the War Production Conference.

RAY E. MORRIS

First vice-president of the A.S.T.E. took an active part in guiding the conference.

molybdenum. More manufacturers substituted the "moly" type H.S.S. that was originally anticipated and the ordnance department in general switched to moly type steels in all grades. As a result, Mo is more out of balance than any other element. Of the other elements used in H.S.S., chromium is in balance at present, vanadium supply and demand are fairly well under control, and cobalt will soon be in balance, though at present is a matter of concern.

In conserving tool materials, there are four points of attack, according to Dr. A. B. Kinzel, Union Carbide & Carbon Research Laboratories and senior consulant, WPB ferrous metal section. These he listed as follows:

(1) Make most effective use of cutting tools; produce more pounds of chips per tool grind.

(2) Keep "alloy efficiency" in mind. For each cubic inch of 18-4-1 H.S.S. there is 0.056 lb. of tungsten plus molybdenum; for the 6-6 moly type, 0.028 lb.; for the cast cobalt-chromium-tungsten grades, 0.050, and for the carbides, 0.66.

(3) Keep inventory efficiency in mind. Obsolete tools should be sent back to the steel mills for remelting. Tipping should be used wherever possible, including H.S.S., which may be brazed, silver soldered or resistance welded to low alloy shanks.

(4) Salvage all scrap by segregating broken stub ends, drillings and turnings. Dr. Kinzel indicated also that as soon as a salvage price structure could be worked out, a program of collecting and recovering H.S.S. from grinding sludge would be announced. He asked grindings to be saved for future collection.

Reviewing what has been accomplished by the tool salvage industry, Larry W. Lang, manager, National Tool Salvage Co., said that many companies are failing to take advantage of this process whereby various types of milling cutters, reamers, thread mills and end mills are reworked by regrinding to tools of a smaller standard size. The life of these recut tools is only slightly less than that of the original tools. A typical reclaimed side mill is illustrated. Mr. Lang also called attention to a new process of welding broken teeth on milling cutters or cutters even broken in half, developed by Thomas Sutton of the Welding Equipment Co. Out of several hundred applications, so far there have been no failures of these tools in service. The cost of welding with a special high speed steel rod and regrinding is 30 to 80 per cent of the original tool cost; this limits the application of the process to tools costing over $40 originally. (See p. 68 for further data.)

Use of cemented carbide tools as much as practicable was urged by Arthur A. Merry, production engineer, Pratt & Whitney Division of United Aircraft, who indicated that the shortage of cutting tools and cutting tool materials was our most serious problem at the present time. When Mr. Murray pointed out to the OPM 18 months ago that $150 worth of perishable tools are consumed in the production of a hypothetical aircraft engine of 1000 hp., he was not believed since it only took $5 worth of tools per 100-hp. automobile engine. Now supply and demand are far apart. Carbides close up the gap between demand and supply by increasing output per tool. As an example, Mr. Merry said that cylinder barrels were now being bored with a single carbide cutter in 3 min., where before it took a multi-blade H.S.S. tool 9 min. to do the same job. The carbide boring machine is belt driven and is equipped with hydraulic feed so as to avoid shock loads on the tool.

Solid Carbide Burrs

"If you can't use carbides, at least you can use carbide practice," the speaker said. "Grind the tools well, make the edges smooth, use minimum clearance for proper edge support, and use tipped material instead of solid shanks. We are getting down close to the bottom of the bin of high speed steel," he added. Mr. Merry condemned free-hand grinding of tools on floor stand grinders and advocated machine grinding. He concluded his talk by illustrating some rotary files or burrs made from solid cemented carbides. On aluminum work they last 100 times as long as H.S.S. burrs and the increased cost is nowhere near as much in the same ratio. In action, they cut like an end mill if the speed is high enough.

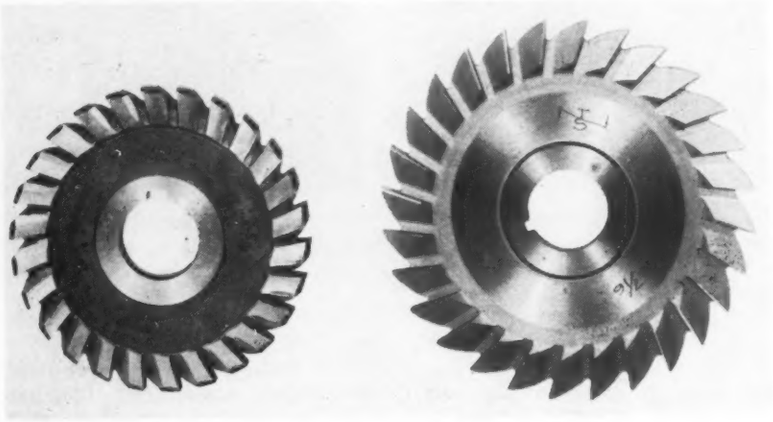
NE Steels Reviewed

Tracing the history of the development of the National Emergency steels, L. S. Bergen, associate director of metallurgy, Crucible Steel Co. of America, said that the hardenability and physical characteristics of these low alloy steels were accurately predicted on paper before any heats were actually made. Through the introduction of molybdenum in varying amounts from 0.20 to 0.40 per cent, it was possible to obtain the characteristic desired with only about 0.50 per cent nickel and chromium. In some respects, the original NE steels were found to be superior to the standard SAE steels of much higher alloy content they were intended to replace.

The NE 8620 carburizing type, for example, as compared to the SAE steels 3115, 4120, 4620 and 6120, was found to have slightly superior tensile strength, yield point only slightly under and reduction of area about the same, for test bars heat treated to equal

Brinell hardness. The Izod impact value was found to be much superior to the SAE types. This is also true for NE 8630 steel. Similarly, NE 8949 steel was found to have physical properties differing only slightly from SAE 3250, 3340 or 4340 when treated to equal hardness.

Unfortunately, Mr. Bergen said, just when industry began to use these steels widely, the shortage of molybdenum made it necessary to revise these series, using much less molybdenum. This was done by increasing the manganese and silicon content. Silicon increases the hardenability in the presence of chrome. Thus, the alloy range in the latest 9000 steels are as follows:



Old (left) and recut (right) side mills. Although the sizes are not relative, this photograph shows how tools can be reground to a smaller size and the useful life almost doubled thereby. Photo by National Tool Salvage Co.

Grade	Mn	Si	Cr	Ni	Mo
NE 9400	.80–1.50	.40–.60	.20–.40	.20–.40	.08–.15
NE 9500	1.20–1.50	.40–.60	.40–.60	.40–.60	.15–.25
NE 9600	1.20–1.50	.40–.60	.40–.60	.....	.....

The properties of NE 9400 steels are about equal to NE 8600 or 8700 steels, except that the impact values are lower, but still not lower than the SAE grades they replace. At least the results on single heats would indicate so. Jominey end quench values show hardenability to be about equal to the SAE steels. Although no mechanical properties have been obtained on the NE 9600 steels, experience with a similar steel sold under the brand name CSM (Halcomb Steel Co.) gives a clue to its probable physical properties as a deep hardening steel.

Plastics in War

Tremendous developments in plastic applications to war products are now going on and by next spring they "will blast the enemy from the face of the earth," according to P. S. Carswell and C. H. Whitlock of the Monsanto Chemical Co., Springfield plastics plant. Most of these new applications are secret, but the speakers were able to point to one direct war application, the M-52B detonator for trench mortar shells. Replacing aluminum, a plastic is perfectly feasible in this low velocity shell where the firing shock of the propellent is low. They also exhibited a helmet liner made of an impregnated fabric material.

Mr. Whitlock indicated that the tread of 10 in. wheels used for hospital beds were being successfully made in plastic in place of rubber. Tests indicate that the plastic will last many times longer than steel wheels. The only disadvantages are the lack of resiliency and the noisier operation as compared with rubber wheels. This substitution is only "for the duration," the speaker pointed out.

Another entirely new application for a plastic is for a piston reamer, developed by the Van Norman Machine Tool Co. in cooperation with Monsanto. High speed steel blades are molded into a plastic body, thus saving 90 per cent of the original weight of an all H.S.S. tool. The blades extend about ⅛ in. from the body. These tools have been very successful and other types of reamers will probably be made on the same principle.

High Impact Strength Plastics

Use of plastics as a substitute for metals is being speeded up by the development of high impact strength plastics. Up until recently such types were compounded by using macerated fabric as a filler instead of wood flour and the like. Such a material is difficult to handle in a transfer mold (injection molding process). Using a new type of twisted cotton cord as a filler gives impact strength two to three times plastics using macerated cloth fillers. Such compositions have superior molding characteristics, transfer molding is facilitated, since the cotton filler flows easier through gates and sprues, and the resin segregation of the phenolic types is minimized. The new high strength material sells for 45c. a lb. as compared with 33c. for macerated cloth filler materials.

Plastic Drill Jigs

Three months time in the tooling for production of the B-17 bomber was saved by the use of plastic drill jigs on sheet metal work having three dimensional contours, according to William F. Asmus, tool engineer, Consolidated Aircraft Corp., who described the construction of plastic jigs and fixtures developed jointly by Lockheed, Vega and Consolidated engineers (THE IRON AGE, July 2, p. 49). These plastic jigs which are made by molding the jig body around a sample sheet metal forming were originally developed as a substitute for wood forms and are not accurate as to jig bushing to more than ±1/32 in. The control of shrinkage has not yet been licked and the effect of ageing has not been finally determined, but studies are being carried on in this direction. When these studies have been completed, greater accuracy in constructing such tools can be expected, Mr. Asmus said.

The newest application of such plastics has been to replace the lead punches ordinarily used in combination with Kirksite dies for drop hammer work. The plastic is more resilient and hence will not tend to batter out of shape the way a lead punch will do after 200 or more pieces have been hammered. Plastics are also being used as hand router forms in connection with the trimming of drop hammer parts. Because of the complexity of such parts, conventional trimming dies are out of the question.

Subcontracting Precise Work

Some of the problems of subcontracting work of a precise nature was described by I. A. Hunt, sales manager, Federal Products Co., Providence. This company continues to make all its own dial indicator gages but has jobbed out work to 40 subcontractors in connection with the manufacture of special gage fixtures. Many of these small shops had been in the jewelry trade and needed to be educated to precise work which is quite different from carving out fancy designs in metals. The Federal company gave every assistance possible in getting subcontractors started.

After a possible subcontractor was located, the equipment of the plant and its experience were analyzed. If deficient in equipment, the plant was given help in rounding out the machinery required. Much Yankee ingenuity was displayed by some of these small shops in modifying existing equipment for the new work, and many were able to do precise work on comparatively old machines. After a contract was awarded, a pilot shipment of parts is requested and jobs are usually priced on the basis of samples submitted rather than on a bid price.

Four expediters keep in touch with subcontractors and were originally responsible for locating such plants. Now an average of two plants a week approach the company for parts work. These expeditors keep weekly reports of the hours worked and the dollar volume produced by each outside plant, also the estimated delivery date on each special product. Thus, close control is maintained of the situation. One of the problems posed is that six subcontractors are running out of work each week and means must be found to keep their machines busy.

Expediters need not be technical men. Two of the most successful used by Federal are a former school teacher and a former automobile salesman. If they need to pass along technical information like speeds and feeds and grinding wheel grades, they can always fall back upon the rest of the parent shop organization for help. Exchange of information of this kind is also attained by an interchange of workmen between the Federal plant and the subcontracting plant.

Single-purpose tooling for a 90-mm. gun mount was described in detail by E. H. Johnson, president, Johnson Tool & Engineering Co., Dayton. The special-purpose, unithead milling and drilling machines are mounted on heavy steel plates which are bolted in turn to concrete pedestals. These machines were described in the June 18 issue of THE IRON AGE, p. 52.

Defends Auto Industry

Conversion of the productive facilities of the automotive industry to armaments manufacture was solely a problem of tooling and "the proof of accomplishment is shown by today's productive output," the War Production Conference of the A.S.T.E. was told by E. A. Clark, vice-president of Budd Wheel Co. Mr. Clark, who is a director of the Automotive Council for War Production, said that the industry's present month-to-month rate of output indicated that production by the year-end would be running at twice its peak peacetime level.

For the quick retooling for war output and the rapid attainment by the industry of mass production of armaments, Mr. Clark said primary credit must go to the tool men. While there has been no great mechanical invention that has come out of the preparations for war, Mr. Clark said, "there has been in Detroit the rediscovery of an old device, an old universal tool that has been dragged forth before now in the face of disaster and only too often laid aside when the danger has passed. It was the simple reliance of one man on another when in trouble."

Men who have been competitors all their lives, who taken together represented the solid front of the entire automotive industry, met last December to talk about their common job in the war and how they could help each other help the nation, and out of their discussions, Mr. Clark recounted, came the Automotive Council for War Production. Members of the council pledged that "the nation will not lack for one gun, one tank, one engine that the capacity and ingenuity of this industry can produce."

To redeem that pledge, Mr. Clark said, the automotive industry immediately pooled its idle equipment, competitive vehicle manufacturers became each others' subcontractors, "parts builders helped life-time rivals fill orders, tool shops reversed their process and hired former customers to do special operations, minds and secret doors were unlocked and circulation of short-cuts and special techniques and know-how between old-time competitors clogged the wires until the council had to start a young newspaper of its own to broadcast the news faster."

More Tools Needed

Pointing out that still more tools will be needed next year when the program calls for the automotive industry to increase its war production to a rate equivalent to three times normal, Mr. Clark forecast "that with the cooperative spirit that has been developed, that goal, too, will be reached."

The post-war task of the tool men, he prophesied, will be even larger than it is now—and vastly different. For one thing, he said, the post war world will be much smaller and "poorer than we have ever known." He urged the tool engineers and designers and builders to "give thought now as to how to carry on" in the reconversion period. And, he said, as badly as America will need retooling for "whatever follows the laying down of guns," world needs will be even greater.

Broken, Multi-Edge Tools

By THOMAS SUTTON
Welding Engineer, Welding Equipment & Supply Co., Detroit

IN all probability the most critical problem that confronts American industry is that of broken tools. While complete elimination of breakage of tools cannot be expected, industry is experiencing alarming excess breakage caused by the carelessness of unskilled labor which is under pressure to get out needed war production in the shortest possible time. The problem is complicated by the fact that the production of war materials necessitates the use of high speed steel tools on metals that have extraordinarily hard and tough qualities. Furthermore, a great many of the products being manufactured today require much greater precision, which means that the tools are only useful for a limited time before the cutting edges wear to the extent where they must be replaced. The situation is aggravated by the wide use of gang-type tools, such as interlocking cutters, each of which must maintain equal dimensions in order to insure uniformity in depth of cuts.

o o o

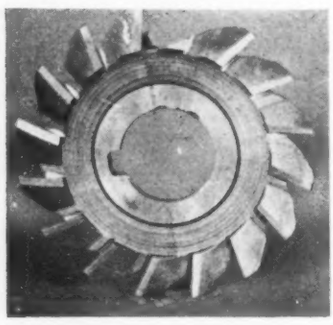
As a result of this excess breakage, there is an alarming shortage of tools, which in a great many instances takes from two to seven months to replace. Numerous factors enter into the situation, which is constantly getting more serious. For example, various vital alloying elements, such as tungsten and cobalt, used in the manufacture of high speed steel are very scarce, and unfortunately there is not enough of the substitute types of H.S.S. to satisfy extreme production demands. Furthermore, there is a shortage of skilled labor incidental to the manufacture of multiple edge cutting tools.

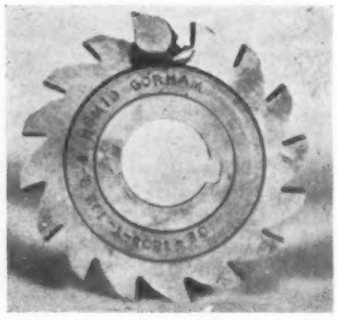
The welding industry has recognized the extreme gravity of the situation and has fostered methods to reclaim high speed steel tools. Inserting of high speed steel cutting tips utilizing a brazed bond, flash welding, arc welding and "cementing" have already been described in previous articles in THE IRON AGE (A number of these articles are included in the reprint pamphlet entitled "How To Increase Cutting Tool Life," price 35c.)

Broken Teeth Replaced

The author, in collaboration with the Welding Equipment & Supply Co. has developed a method of reclaiming tools with broken teeth, flutes, tangs, shanks, and partial or complete fractures through the keyway of such tools as milling cutters, ball and end mills; also line reamers, broaches, drills and special shaped forming tools and single point cutting tools for lathes, planers and shapers. The method, called Suttonizing, differs from those most generally used to effect reclamation in that in most cases subsequent heat treatment of the tools is not necessary. The possibility of dimensional distortion is thereby minimized. Especially in the reclamation of large and small broaches where repairs must be made to teeth, it is of the utmost importance that heat treatment be avoided. This welding process also differs from insert methods in that the adding of alloys by welding results in the deposits becoming integral parts of the tools. Susceptibility to rebreaking is thereby greatly lowered.

In the research work incidental to the development of the method, considerable thought was given to the metallurgical aspects of the welding rod to be employed, as well as to the proper technique involved in application. The aim was to se-

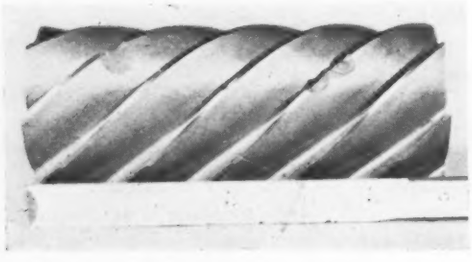




ABOVE

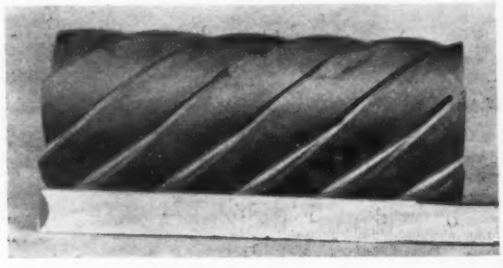
BEFORE and after milling cutter tooth was replaced by "Suttonizing." Rough ground.

o o o



LEFT AND RIGHT

BEFORE and after chipped flutes on special spiral parabolic mill were repaired by Suttonizing. Rough ground.



Reclaimed by Welding . . .

cure deposits that would be hard "as welded" and would require no subsequent heat treatment. Experiments indicated that a conventional high speed steel rod could not be used to make the necessary air hardening deposit in the weld zone because its use would necessitate heat treatment and an oil quench. Experiments were also made with conventional cobalt base hard facing rods. While deposits secured with these types are hard "as welded" such hard basic materials were primarily developed to be abrasive resistant, which means that they are more difficult to grind.

In direct contrast to these mediums, the Suttonizing process provides a means of combining the cutting qualities of conventional high speed steel with abrasive resistant qualities about equal to the typical tungsten carbides. The deposits on the other hand are as easy to grind as conventional high speed steel. It is therefore possible to combine fine cutting qualities and wear resistance in the structure of the weld.

Because of the versatility of the medium used, the process is applicable also to tools requiring resistance to abrasive only, such as lathe centers, centerless grinder rests and spinning tools.

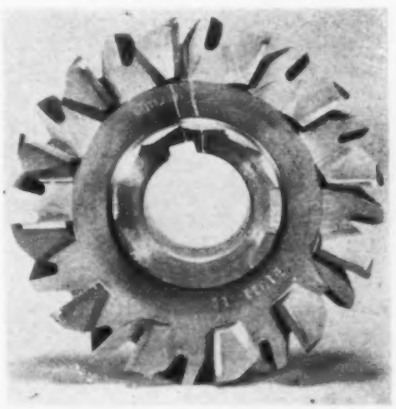
Pre-heat Treatment Necessary

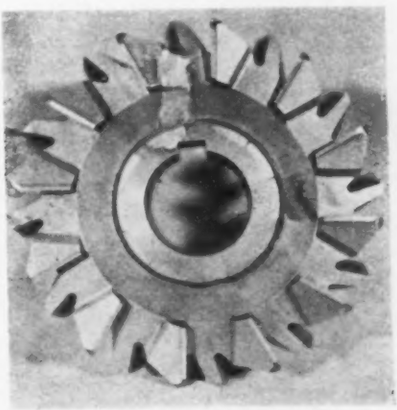
In order to eliminate the necessity for heat treatment after welding, the process involves pre-heating the tool in a mercury bath at 750 deg. F. for approximately 10 min. The maintenance of a constant pre-heat during the welding operation and skill in proper post heating is of vital importance. There is a minimum amount of decarburization since the deposits are air hardening. In order to secure the highest cutting efficiency, a maximum of ¼ in. depth of deposit is made. In the process no appreciable reduction in hardness adjacent to the weld deposit is encountered. Tests on shell end mills indicated that the drop in hardness is not more than 1½ to 2 points on the Rockwell "C" scale.

. . . Welding of broken milling cutters, reamers, etc., has been experimented with by scores of engineers and metallurgists for the past 30 years. Some success has been attained with silver solders and with atomic hydrogen welding. The technique mentioned in this article is a proprietory method that shows considerable promise.

The ease by which contours on most tools can be maintained in the welding operation makes a minimum of grinding necessary after welding. Extensive use of the process has indicated that in a great many cases, high speed steel tools faced by this method result in an increase in tool life between grinds of as much as three to one over the original tool.

The Suttonizing method can also be used for the composite construction of such tools as lathe, planer, boring, cut-off, shaper and special forming tools. This technique en-



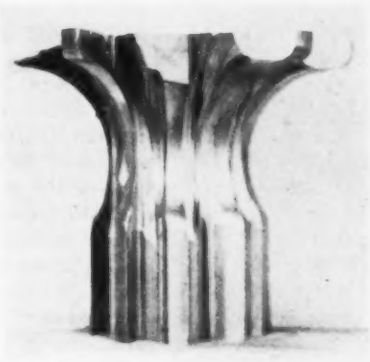


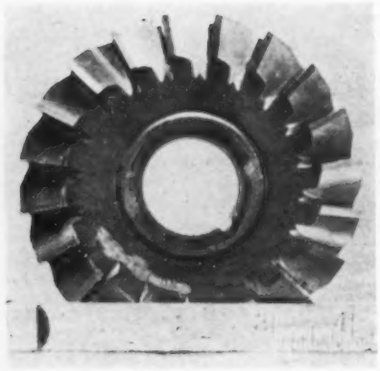
ABOVE

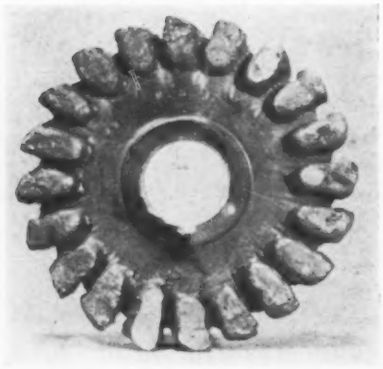
MILLING cutter fractured through keyway and repaired by welding. Rough ground but ready for use.

BELOW

BEFORE and after one tooth was replaced on special form milling cutter by Suttonizing. Rough ground.







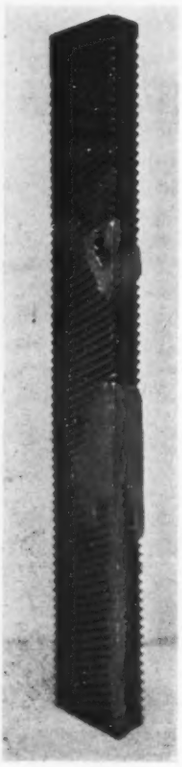
LEFT

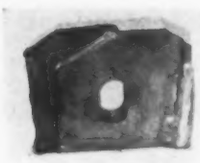
MILLING cutter before and after diameter and thickness was increased by Suttonizing. Rough ground.

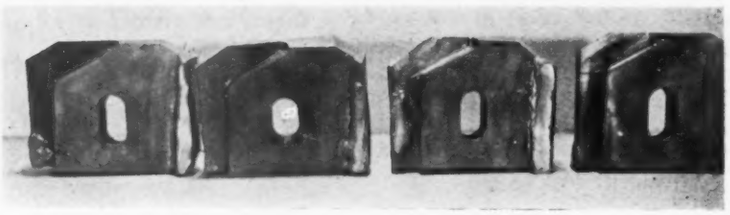
° ° °

BELOW

BROKEN retaining shoulders on gun drills repaired by welded lay-on. Rough ground.







° ° °

LEFT

SPECIAL broach showing welded repair areas. Rough ground.

° ° °

tails the facing of low alloy shanks, such as S.A.E. 1335, with the special alloy involved. Approximately 90 per cent of the tools thus constructed can be put into operation after grinding without time-consuming heat treatment after welding.

At the present time this process is not available to industry generally even on a license basis. The process itself involves a combination of welding, mechanical and metallurgical skill, and necessitates the very best of direct supervision. We have tried in the past to train operators from other welding companies to do this work, but they have failed to follow through, once they are away from direct supervision at our plant. There is also the fact that at the present time there is a limited quantity of the alloy available to effect the repair.

Since few companies in the country, including our own, are equipped to do the regrinding of welded tools, this phase of the work is being done through the facilities of the National Tool Salvage Co., Detroit, which has specialized in the restoration of worn-out tools by regrinding. Use is also being made of the nation-wide sales organization of this company.

The illustrations show typical examples of broken tools that have been repaired by this welding and regrinding process.

Nitrogen's Effect on Chromium-Nickel Steels

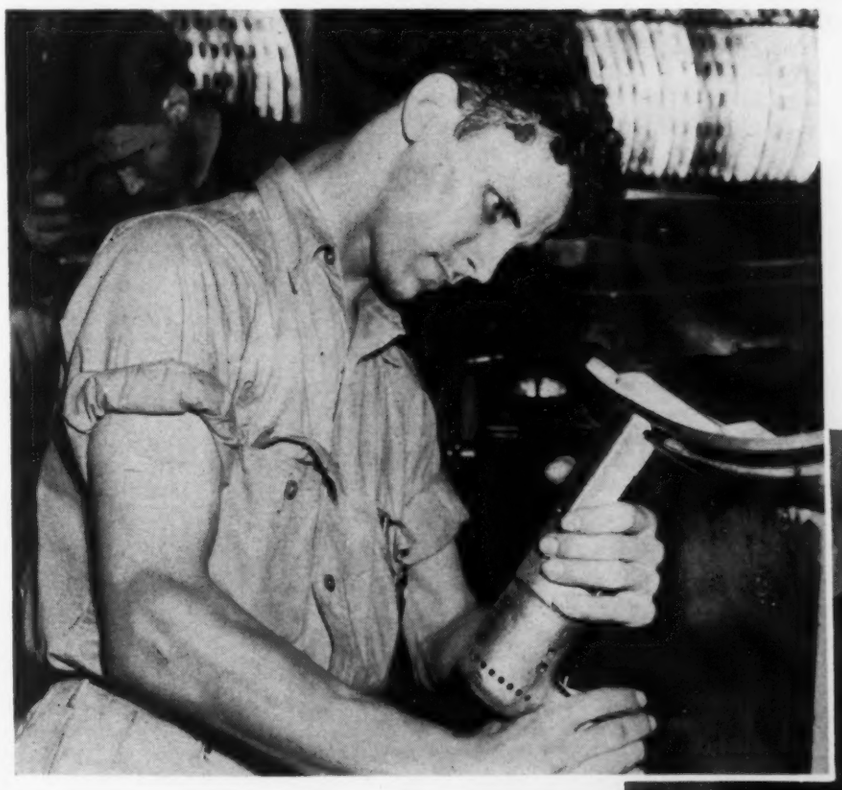
FIVE conclusions on the effect of nitrogen on physical properties, structure and heat and corrosion resistance of chromium-nickel steels containing between 6 and 25 per cent of chromium and 1 and 13 per cent of nickel, have been arrived at by R. Scherer, G. Riedrich and H. Kessner, as reported in *Stahl und Eisen*. The conclusions to which the authors' investigation led are: (1) The 0.2 per cent proof stress of austenitic chromium-nickel steels, and of austenitic-ferritic chromium-nickel steels with over 30 per cent of austenite, is increased by about 11,380 lb. per sq. in. by the presence of 0.10 to 0.12 per cent of nitrogen. (2) The other strength properties are not noticeably affected, provided that the structure has remained unaltered. (3) With regard to the structure, 0.15 per cent of nitrogen can replace about 2 to 4 per cent of nickel, and 0.25 per cent can replace about 2.5 to 6 per cent of nickel, depending on the chromium content, because nitrogen has the effect of increasing the stability of the austenite phase of chromium-nickel steels. This is of special practical importance in 18-8 chromium-nickel steels. (4) The susceptibility to embrittlement on annealing at higher temperatures is not affected by nitrogen. (5) Austenitic and austenitic-ferritic steels with about 0.10 per cent of carbon, 21 to 25 per cent of chromium, 4 to 5.5 per cent of nickel and about 0.20 per cent of nitrogen are recommended as oxidation and acid-resistant material, and an austenitic steel with about 0.15 per cent of carbon, 22 per cent of chromium, 13 per cent of nickel, 1.5 per cent of silicon and 0.20 per cent of nitrogen is suggested as a substitute for certain heat-resistant steels containing about 0.15 per cent of carbon, 25 per cent of chromium, 20 per cent of nickel and 2 per cent of silicon.

Workers Trade Ideas for Money

MANY companies long have known that the workers themselves constitute the most readily tapped source of new production ideas, improvements in tools and equipment, and methods for speeding production. Every stuffed suggestion box brings its one or two ideas that can be mutually profitable to the company and the employee. Workers of the Glenn L. Martin Co., makers of the big Martin bomber known as the B-26 or Baltimore, are finding fun, profit and increasing efficiency in plant suggestions. The result is more bombers, improved working conditions, and a bonus check for the employees involved.

ABOVE

RIVETING around corners: Jim Porter, Glenn Martin employee, devised a bent-peen riveting hammer which takes the irritation out of around-the-corner riveting jobs.



ABOVE

FILES by power: Gordon Hamer, another Martin smart-thinker, has developed this power operated file that helps him to clean up four cowlings in the time ordinarily needed to do one.

BELOW

THE bonus check: The picture is obviously posed, but Joe Holthaus is even more pleased than he looks with the substantial Martin check for his production idea. Joe developed a brush that cleans the hulls of PBM-3 flying boats in 60 per cent less time.

25-Sec. Quenching for Li

A SPECIAL quench system which permits withdrawing and quenching 4 tons of aluminum castings in 25 sec. is one of the features of a new aluminum alloy heat treating furnace recently installed in an Ohio plant. Need for greatly increased production of aluminum castings prompted the installation, according to plant officials.

This unusual material handling system enables an operator to do in 5 min. an operation which formerly required from 2 to 3 hr. In addition, the fully charged furnace may be kept in continuous operation, handling capacity loads in the chamber, then quenching each big load as a unit in a matter of seconds. Reloading immediately follows. The unit, which is believed to be the first of its kind in the country, was designed and installed by the Despatch Oven Co., Minneapolis. Uniformity of ± 5 deg. F. is claimed for the furnace interior. Magnesium castings may also be handled by this unit.

In operation, two load platforms are used, the cargo of one being heat treated while the load which preceded it is being quenched and unloaded. As a processed load is pulled from the furnace, it is quickly dropped by elevator into the quench bath, as shown in the illustration below. Rollers on top of the elevator cage then form a bridge

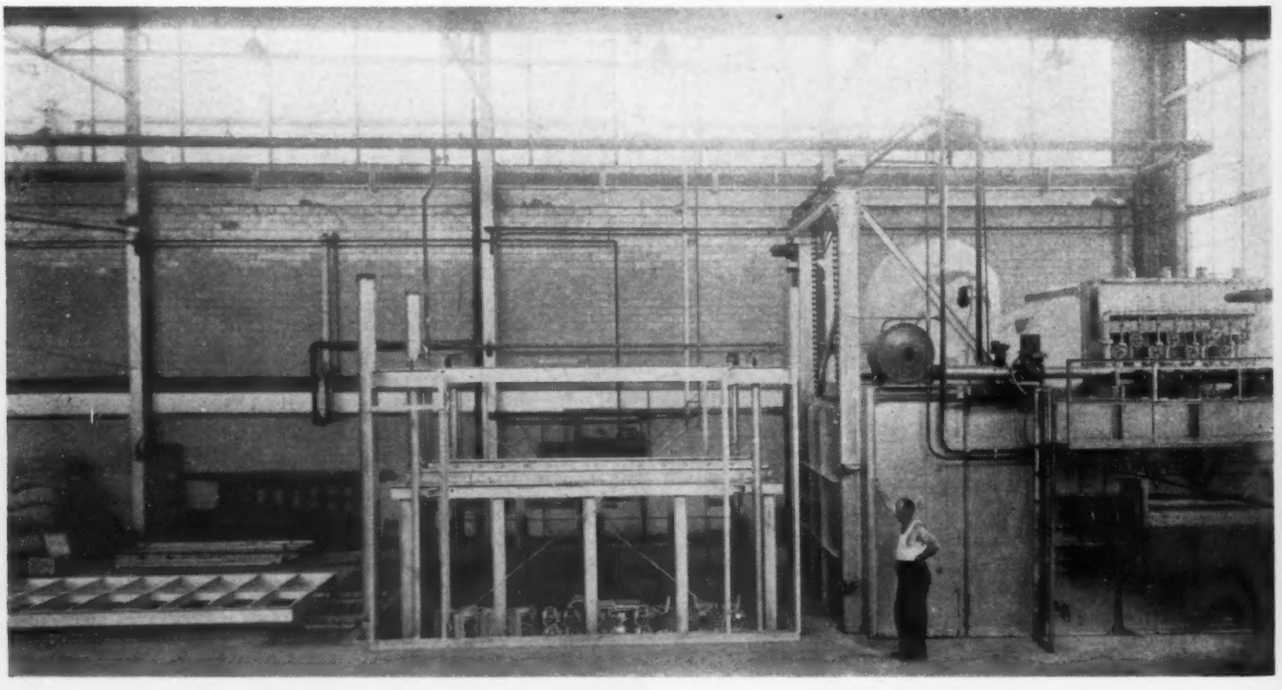
RIGHT

END view of the new aluminum casting quenching and heat treating equipment installed by Despatch Oven Co. The air operated winch in the foreground is used to pull hot loads from the oven. The elevator cage is shown raised to floor level.

° ° °

BELOW

A LOAD of aluminum castings which have just been removed from the heat treating furnace is shown here being lowered into the quench tank. As soon as this charge is completely immersed in the quench, rollers mounted on top of the cage will be in alinement with rollers under the car to the left of the cage and also with rollers leading into the furnace. Thus a new charge may be pushed into the oven while one charge is being quenched, greatly reducing the down time of the furnace.



over which the waiting load platform (shown to the left in this photo) with its raw charge, is pushed into the furnace.

When the unit was first put into operation, about 30 sec. were required to pull the load and quench it. It is expected that after some experience, an operator can handle the entire process in 20 sec.

The unit as installed in the Ohio plant has three divisions: The loading section, the quench section and the furnace. Each of these bears a series of rollers, carefully alined, which form a smooth track over which the loaded platforms can easily be pulled by an air operated winch, visible in the photo below.

The loading section is of heavy structural steel, capable of supporting the load platform, each of which may carry a gross charge in excess of 11,000 lb. The upper surface of the loading section carries a series of steel rollers.

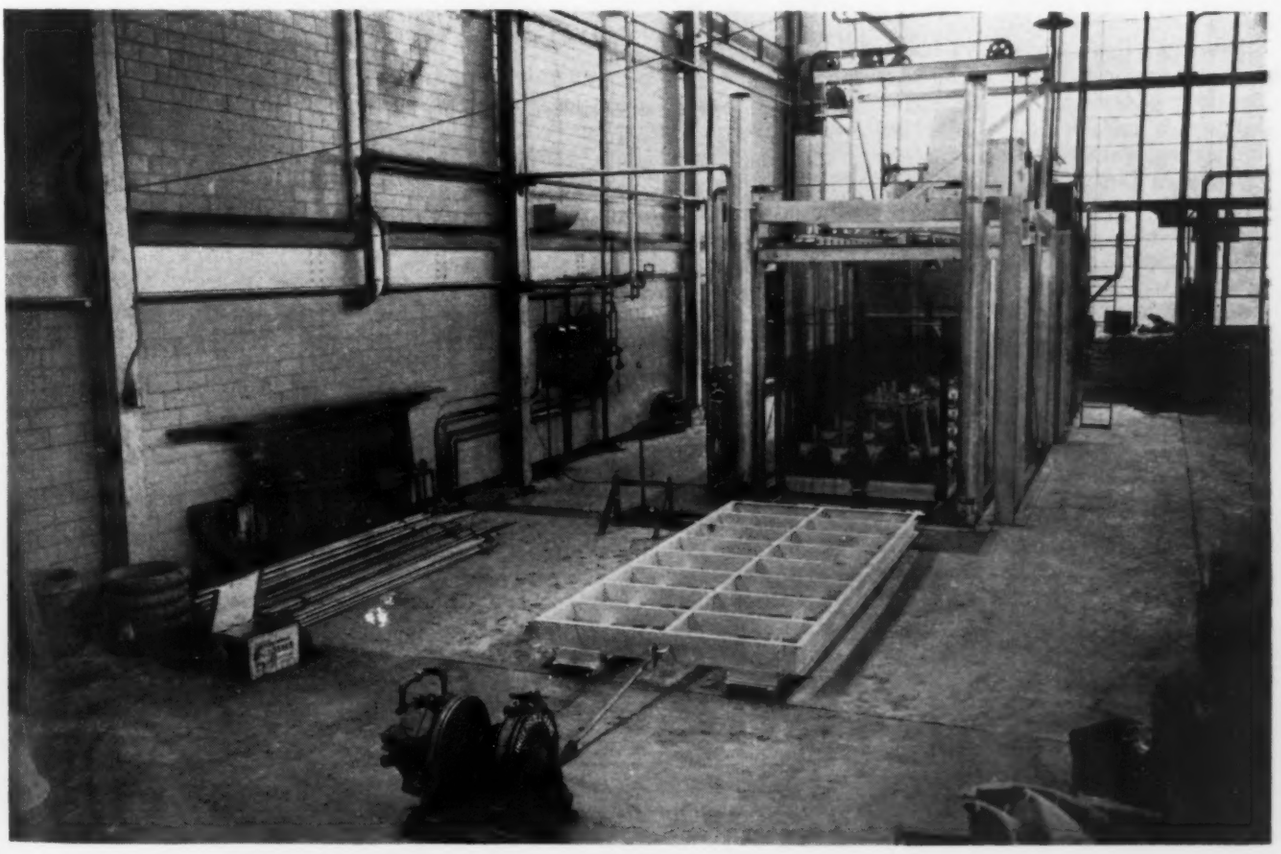
The quench section (17 ft. long, 8½ ft. wide and 11 ft. high) includes a steel elevator cage with air hoist equipment, a tank and suitable drain and overflow. Two Eclipse burners heat the bath, and automatic temperature control is provided.

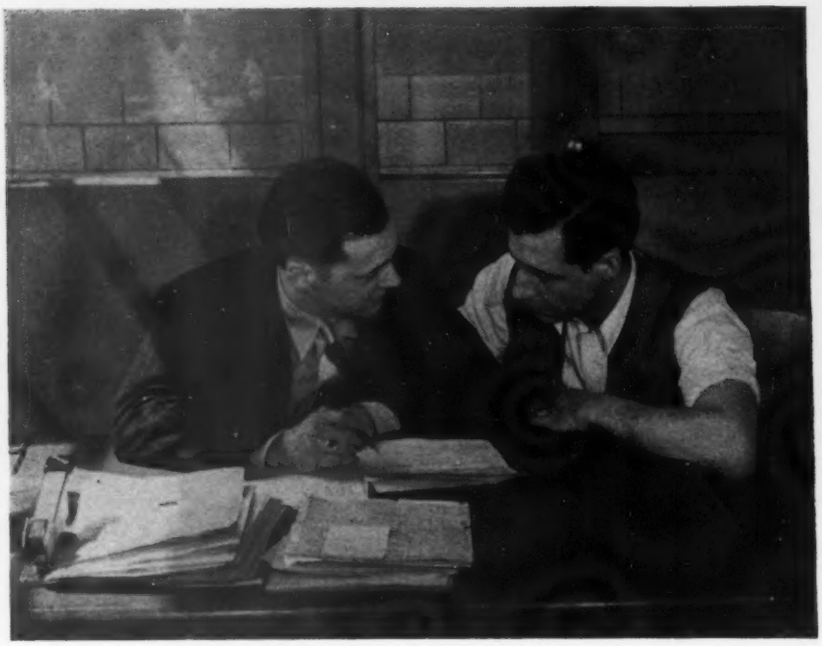
Rollers in the quench section are mounted on top of the elevator cage and also on the bottom. Thus there is always an "open track" from loading section to furnace chamber; this is true whether cage is raised to floor level or immersed in quench bath.

The furnace is of the radiant tube convection type with indirect gas heating. No combustion gases enter the work chamber and all types of aluminum alloys (including Nos. 355 and 356) can be heat treated.

The heat flow is both vertical and horizontal. Heat enters through ducts on the sides of the furnace, while a recirculating duct is in the furnace ceiling. The floor carries the steel rollers which are alined with similar rollers on the elevator cage and the loading section.

Since the installation of this new unit, plant officials report much faster casting treatment, a noticeable saving in heat through improved recirculation and a smoother operating cycle.





APPLICANT at Thompson Products having learner training explained to him. Regular application form is used.

o o o

Thompson Products

By ROY W. BENDER
Director of Training,
Thompson Aircraft Products Co.

o o o

THE various training programs now in use at Thompson Products plant have been set up to serve a number of purposes—training people who are starting on their first job in industry, retraining of workers who have had long experience in non-defense industries and non-metal working industries, and upgrading of people already on the payroll. This latter phase of the program has come about because those who were not able to qualify for learner training when it was first inaugurated two years ago were placed on low skilled jobs. Later on, because of the difficulty of securing new men with shop experience, supervisors were faced with the problem of upgrading these workers or the workers themselves woud ask for another opportunity to receive learner training. It was found advantageous to give these workers the theoretical courses inasmuch as many of them, although they had been at work for one or two years still had not acquired any knowledge of manufacturing nor the use of such elementary measuring instruments as the common steel rule and micrometer, nor could they read blueprints. One of the objects of this program was to make up for these deficiencies.

At the new Thompson Products aircraft products plant, where the working force has had to be built up from almost entirely green labor, the training programs have proven most effective. The basis of any training program is proper selection of candidates. At Thompson Products this selection takes place in several stages. In the first place, all employees, as a part of the hiring technique, are subject not only to the usual type of interview and the obtaining of personal histories in the form of application blanks, but each candidate is also subjected to a battery of psychological tests. In order to simplify the paper work in these tests, which are in question and answer form, both from the administration and scoring points of view, a simple mechanical system has been worked out so that for each question asked, the candidate need only place the pointer on one of three or four possible answers indicated on a chart. The pointer is duplicated on the back of the board and depending upon whether or not it contacts the "right answer" determines the score. In grading the tests, the observer need only count those pointers on the rear of the board that are on buttons.

This battery of psychological tests gives clues as to the person's knowledge of mechanism and machine work, his interest in factory occupation, his intelligence, his emotional stability and his capacity for leadership. These tests were devised by a professor at a local college and in order to check their accuracy as to predictability of success of workers on the job, they have been correlated against successful workers in the plant. This correlation has been found to be close enough to confirm the reliability of the tests.

Only applicants making an average grade of 30 per cent on the five tests are considered for the preliminary training program. All applicants who do not make the qualifying grade are referred to the employment office for consideration where they are either disqualified as unfit for work in the plant or are placed on low-skilled jobs and informed that they cannot apply for either upgrading or learner training again.

All applicants hired for jobs

INSTRUCTOR uses many visual aids in learners' class.

° ° °

Training Programs

. . . Most learner training programs are based on a preliminary course of instruction either in a trade school or in a so-called vestibule school (see THE IRON AGE, Sept. 10 issue, for a description of the Warner & Swasey vestibule school). Thompson Products and its various subsidiary companies has what is probably one of the best training programs in the country, inasmuch as the new worker is "on his own" after two days of such training in the plant.

from where they may later be upgraded or selected to receive learner training must first qualify on a 5-hr. preliminary training course, before being placed on the job. This preliminary training consists of five continuous hours of classroom instruction as follows:

a. The use of the common scale, micrometer and decimal equivalents	1½ hr.
b. Elementary blueprint reading	¾ hr.
c. Manufacturing standards	¾ hr.
d. Test on the above subjects	1 hr.
e. Movie carrying a running story to indicate company policies, regulations, use of time and trailer cards, bonus systems, shop conduct, safety, etc.	¾ hr.

The training department furnishes the employment office with a list of the grades attained in this classroom work and designates all those who do not qualify. Those who do qualify are assigned to job instructors in the shop itself the following day. There is approximately one job instructor for each 20 learners. In the shop period the candidates has a learner status for eight weeks. On the first day the learner works as an observer alongside a regular operator. On the following day, however, learners are placed on their own machines and are given assistance from time to time by the job instructor and the regular operator with whom they had been observing the first day in the shop.

These job instructors are members of the trade training department. In determining what jobs learners are to work on, assignment of machines and other matters pertaining to group control, they must clear through the department's group supervisors. All charges for the learner training program, including wages paid learners, are borne by the trade training department. At the same time, this department receives credit for all work produced by learners according to accounts kept of such work checked and approved by the job instructors.

Progress Records Kept

Constant records are kept of the progress of each learner, and by the end of the first month there are definite indications just which ones are faltering behind the others. The faltering learners are usually set on the right track after a good talking to, during which time those who are not taking their studies seriously are impressed with the fact that it is a necessary part of the course and unless they perform such work, they will have to be dropped entirely.

During the eight-week learner training period, the learner attends two classroom sessions weekly, consisting of an hour each, held after regular working hours. Table I shows the course of classroom in-

TABLE I

Outline for Production Learners

1. **MANUFACTURING STANDARDS**
   - a. Methods of manufacture
   - b. Fits, tolerances, and allowances ..... 1 hr.
2. **GAGING METHODS**
   - a. Fixed gages
   - b. Adjustable limit gages
   - c. Comparator and indicating gages ..... 1 hr.
3. **DRAWING STANDARDS**
   - a. Methods of projection
   - b. Methods of dimensioning
   - c. Explanation of notes ..... 1 hr.
4. **BLUE PRINTS**
   - a. Part prints
   - b. Operation prints ..... 1 hr.
5. **ROUTING SHEET**
   - a. Explanation of operation numbers
   - b. Set-up sheets ..... 1 hr.
6. **MATERIALS**
   - a. Iron and steel manufacture
   - b. Non-ferrous alloys ..... 1 hr.
7. **S.A.E. STEEL SPECIFICATIONS**
   - a. Aircraft steels
   - b. Comparison between aircraft and S.A.E. steel ..... 1 hr.
8. **HEAT TREATMENT**
   - a. Definition of terms
   - b. Explanation of heat treat ..... 1 hr.
9. **MACHINABILITY OF MATERIALS**
   - a. Machinability ratings
   - b. Characteristics of materials ..... 1 hr.
10. **Test on above lectures** ..... 1 hr.

struction for all production learners during the first five weeks and Tables II and III show the course outline for the following three weeks for either machine specialization learners or grinding specialization learners.

Regular employees in the shop can be drawn off a job for learner training where the work is of such a nature that the applicant can be replaced satisfactorily and that a replacement can be done gracefully and is agreeable to the foreman. Application blanks for learner training are filled out by the employee and are filed in the Coordination Office where they are given proper consideration. If the applicant comes up to standard, the Coordination Department initiates the request for transfer through the employment office.

Graduated rates of pay have been set up for learners in the shop, a higher rate being paid for the second four weeks than the first four weeks. In the classroom, learners are paid at a lower base rate. No group bonus is paid for any of these hours. At the conclusion of the eight-week period, learners are either released as unsatisfactory for the work or else increased to the minimum rate of the job for which they have been trained or such rates above the minimum as their production may warrant in the group supervisor's judgment. However, as soon as a learner has attained a satisfactory production to pay for the cost of the product turned out, they may be worked up to the regular schedule of the department and paid the regular overtime premium. In June, for example, Thompson Products learners were 91 per cent efficient from the standpoint of man-hours of work performed, and 143 per cent efficient from the standpoint of the value of work turned out against the learner pay and instruction cost.

Tool Room Training

The above program applies to the training of production workers as machine specialists. A program has also been worked out for developing single purpose tool room machine hands. This course is obviously much longer than the regular production training course, the standard period being 17 weeks, which incidentally is double the time that the long term apprentices actually spend in the tool room, learning to operate the same class of machines. Practically the same system of inducting workers into this class of training is applied as in the case of production workers. All learners are first given one full day preinstruction in the class room and on the following day are assigned to shop instructors purely as observers. On the third day, the learners are placed on their own machines to be given such assistance as may be necessary from the shop instructor and regular tool room supervisor. The objective is to make a qualified tool room machine hand in the shortest possible period of time.

Here again a regular schedule of compensation rates, advanced each month, has been worked out, also a base rate for time spent in related classroom instruction. At the conclusion of the 17-week period learners are either released as unsatisfactory or else transferred to the tool room as regular employees, receiving the minimum rate of the job they have trained on, or such rate above the minimum as their ability may warrant. It should be noted that women take the same training course as is assigned to men trainees.

As before, two classroom sessions are held weekly consisting of 1 hr. each. These instructions are necessarily more detailed than those given the production workers as outlined in Tables IV and V. It will be noted that shop practice, shop mathematics have been treated separately. The reason for this is to enable proper pre-assignment of homework. It is a proven fact that, if an instructor will anticipate what he will teach the following lesson, and assign definite related material for home study, much time of instruction can be saved.

Incidentally, the shop mathematics, although listed as 1 hr. duration, generally requires less than an hour, the remaining time being spent as a question period allowing the learner to ask any questions relative to his shop work. We advocate the teaching of shop mathematics at Thompson Products because it is one of the best ways of teaching the person how to think clearly and to analyze his work before he starts. Another reason is

TABLE II

Outline for Production Learners

Machine Specialization

1. **SINGLE POINT TOOLS**
   - a. Materials used
   - b. Proper grinding ..... 1 hr.
2. **DRILLS AND REAMERS**
   - a. Types of drills and their use
   - b. Types of reamers and their use 1 hr.
3. **SPEEDS AND FEEDS**
   - a. Factors governing speeds and feeds
   - b. For drilling and reaming
   - c. Coolants ..... 1 hr.
4. **SCREW THREADS**
   - a. Thread forms
   - b. Thread notations
   - c. Tap drill sizes ..... 1 hr.
5. **STANDARD AUXILIARY TOOLS**
   - a. Box mills
   - b. Die heads and tapping attachments ..... 1 hr.
6. **FORM TOOLS**
   - a. Flat
   - b. Dovetail
   - c. Circular ..... 1 hr.

TABLE III

Outline for Production Learners

Grinding Specialization

1. **ABRASIVES**
   - a. Natural and manufactured
   - b. Characteristics of abrasives
   - c. Bonds ..... 1 hr.
2. **MANUFACTURE OF GRINDING WHEELS**
   - a. Wheel grading (Norton and Carborundum) ..... 1 hr.
3. **THEORY OF GRINDING** ..... 1 hr.
4. **WHEEL SELECTION**
   - a. Speeds and feeds
   - b. Area of contact
   - c. Traverse and plunge cut ..... 1 hr.
5. **WHEEL TRUING AND DRESSING**
   - a. Types of dressers
   - b. Types of diamonds
   - c. Coolants ..... 1 hr.
6. **COMMON GRINDING ERRORS**
   - a. Their cause and remedy
   - b. Safety ..... 1 hr.

that because of the overcrowded conditions in the tool design department, it is not always possible for the tool designer to place all the dimensional information on the print, which would be the ideal set-up. The problem then resolves itself into whether we should train the draftsman to insure that this will be done, or should we continue to teach mathematics to tool room specialists. Because most tool room designers are working overtime, it was decided to teach the mathematics to the tool room machine workers during this 17-week instruction period. Similar programs have been worked out for training inspectors in both two-month and four-month courses, depending upon the class of work the man will ultimately do. The four-month program is obviously much more thorough.

Training Instructors

It was mentioned that each shop instructor has under his charge about 20 learners. When a fresh batch of learners comes into his division, the first thing the instructor does is to explain all rules, regulations and policies affecting his particular department. An actual demonstration is then given of the working parts, adjustments, limitations, safety precautions and the proper care of the particular type of equipment to which the learner will be assigned. The instructor also explains the common facts about the job, the peculiar working properties of the material, the danger points, the health factors and the cost factors. He explains the ways to avoid waste and mistakes, to maintain quality standards and output and then cites all the short cuts.

At Thompson Products, we use the instruction methods recommended by the War Production Board, which will be described briefly for those not familiar with the procedure. Fundamentally, the WPB plan follows what is considered to be best teaching methods. Instruction material has been prepared in order to teach the shop work instructors how to instruct. The first point deals with preparation of the instructor. He is cautioned to prepare a time table, to break down the job, to have everything ready and to have the work place properly arranged, just as the worker is expected to keep it. The use of a time table is intended to answer the question of how much skill a man is expected to have and

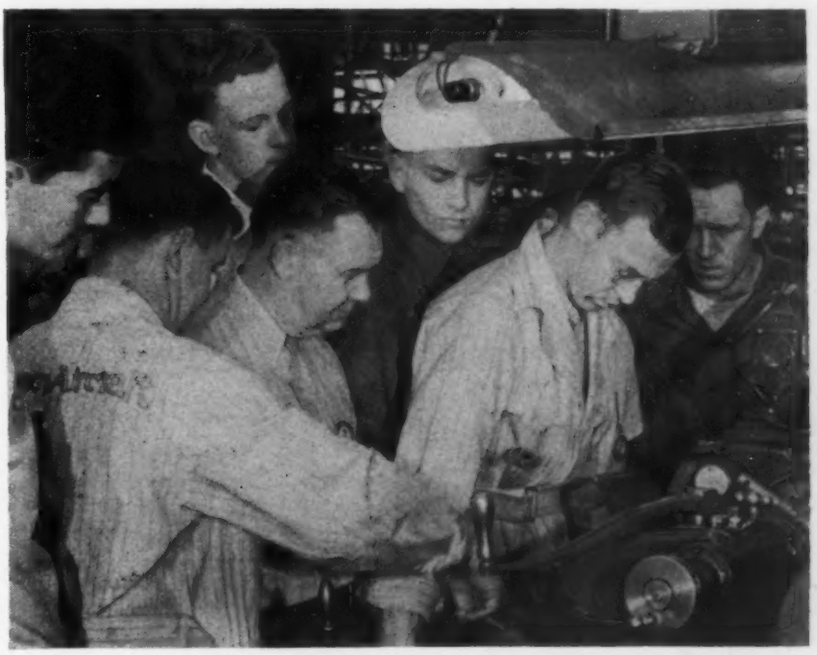
TABLE IV
Shop Practice

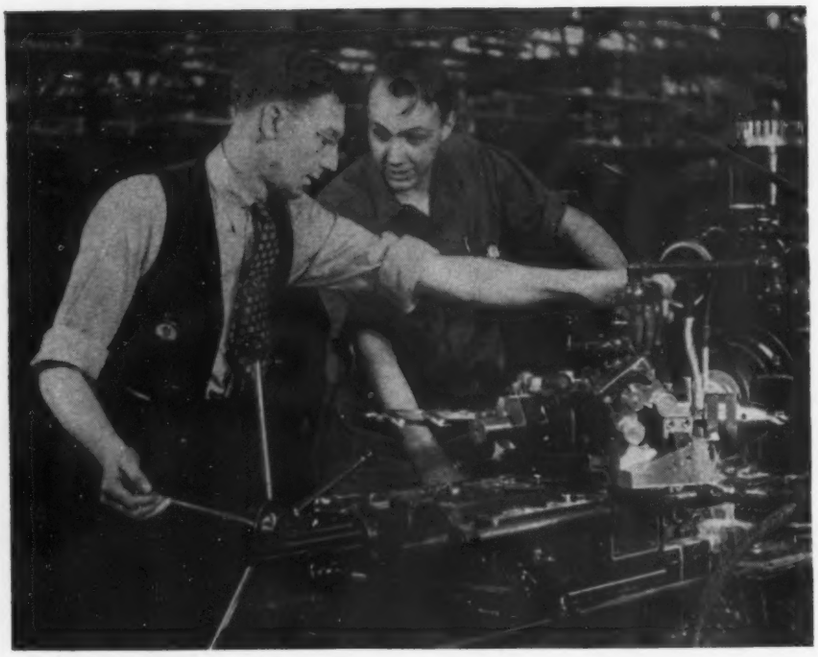
1. PRECISION TOOLS
   - a. Rules
   - b. Combination square
   - c. Calipers
   - d. Telescope gages
2. PRECISION TOOLS (Continued)
   - a. Micrometer (all types)
   - b. Vernier tools
   - c. Height gage and surface gage
3. MECHANICAL DRAWING STANDARDS
   - a. Methods of projection
   - b. Method of dimensioning
   - c. Interpretation of notes
4. BLUEPRINT READING
   - a. Tapco Stds. or Thompson Stds. (depending on place of employment)
   - b. Detail and assembly prints
5. MANUFACTURING STANDARDS
   - a. History of manufacturing
   - b. Classes of machine fits
6. MANUFACTURING STANDARDS
   - a. Tolerances and allowances
   - b. Standard tapers
7. GAGING METHODS
   - a. Fixed gages
   - b. Adjustable limit gages
   - c. Template gages
   - d. Visual gages
   - e. Comparators
8. SCREW THREAD STANDARDS
   - a. American national thread forms
   - b. Definition of thread terms
9. SCREW THREAD PROBLEMS
   - a. Computing tap drill size
   - b. Three wire system
10. MATERIALS
    - a. Manufacture of iron base alloys
    - b. S.A.E. Specifications
11. HEAT TREATMENT
    - a. Definition of terms
12. HARDNESS TESTING
    - a. Brinnel
    - b. Sclerescope
    - c. Rockwell
13. MACHINABILITY OF MATERIALS
    - a. Material ratings
    - b. Speeds and feeds
14. THEORY OF SINGLE POINT TOOLS
    - a. Grinding hints
15. DRILLS AND REAMERS
    - a. Various types
16. TEST ON SHOP PRACTICES
17. ABRASIVES AND BONDS
    - a. Natural abrasives
    - b. Manufactured abrasives
    - c. Types of bonds
18. THEORY OF GRINDING
19. WHEEL GRADING
    - a. Wheel selection
    - b. Wheel truing

TABLE V
Shop Math

1. FRACTIONS
   Math Lesson No. 1
2. MULTIPLICATION OF FRACTIONS
   Math Lesson No. 2
3. DECIMALS
   Math Lesson No. 3
4. CHECKING MULTIPLICATION AND DIVISION BY EXCESS OF NINES
   Math Lesson No. 4
5. TRANSPORTATION OF FORMULAE
   Math Lesson No. 6
6. CIRCUMFERENCES, AREAS AND VOLUMES
   Math Lesson No. 7
7. GEOMETRY
   Math Lesson No. 9
8. PYTHAGOREAN THEOREM
   Math Lesson No. 10
9. INTRODUCTION TO TRIGONOMETRY
   Math Lesson No. 11
10. INTERPOLATION
    Math Lesson No. 12
11. RIGHT ANGLE PROBLEMS
    Math Lesson No. 13
12. DOVETAILS
    Math Lesson No. 14
13. CHORDAL DISTANCES
    Math Lesson No. 15
14. TAPER PROBLEMS
    Lesson No. 22
15. TEST ON SHOP MATH

Floor instructor with learners in shop.





FOREMAN instructing learner after assignment to machine. He is helping to straighten out a kink.

how soon. The inspector usually makes out a time table showing for each man the date he expects him to be able to do the job he is supposed to learn.

Breaking down the job means analyzing the job so as to pick out the key points for the particular factors that make or break the operation. If the job is properly analyzed and the worker properly instructed, he will do the operation right the first time. These breakdown sheets are for the use of the instructor in his teaching work and are not given to the workers. Usually when skilled mechanics are put in the shop as instructors, they know the job so well that they have forgotten the things that "stump" the average greenhorn. Getting these to look at the job from the learner's point of view is one of the keys to proper instruction in the shop.

Assuming that the instructor has been properly prepared himself, there are four main factors in teaching brought out in the WPB plan:

Step 1—Prepare the worker to receive the instruction. Put him at ease. Find out what he already knows about the job and start in where his knowledge ends. Get him interested by relating his job or operation to the final product so he knows his work is important. Finally, put him in the right position so that he will see the job only from the angle from which he will actually work.

Step 2—Present the operation. Tell him, show him, illustrate and ask questions. "Put it over" in small doses. Make the key points clear. Be patient and go slowly inasmuch as the average worker cannot catch the six or eight new ideas at one time and really understand them. Repeat the job and the explanation necessary.

Step 3—Try out the worker's performance. Have the worker do the job, but watch him. Then have him do it again and explain to the instructor what he is doing and why. Correct his errors but don't bawl him out or indicate that he is "thick" and "dumb." Continue doing all this until you know he knows. He may have to do the job a half dozen times.

Step 4 — Follow-up. Put the worker on his own. Tell him whom he should go to if he needs help. Check him frequently, perhaps every few minutes at the start, to every few hours or few days later on. Taper off this extra coaching until he is able to work under normal supervision. On the other hand, be careful about your taking the job over too soon or too often. Don't take it over at all if you can point out the help the worker needs.

The real test of this plan is that it has worked in thousands of industrial training cases, but as the WPB points out, "if the worker hasn't learned, the instructor hasn't taught."

Courses currently being given under the Thompson Products training program cover the following types of work:

Production	Milling machines	
"	Turret lathes	
"	Automatic screw machines for bar stock	Operators and also setup men
"	Automatic screw machines for chucking	
"	Surface grinders	
"	Center grinders	
"	Thread grinders	
"	Internal grinders	
"	Centerless grinders	
Tool and cutter grinders		
Tool Room	Shaper hands	
"	Lathe hands	
"	Milling machine hands	
"	Planer and boring mill	
"	Gages and templates	
"	Surface grinders	
"	Universal grinders	
Inspectors		
Junior draftsmen		

Graduate learner at work on lathe in tool room. Now a good machinist.

Precision Pipe Bending

REFERENCE was recently made* to a new technique in precision pipe bending by special press methods, developed by Blackburn Aircraft Ltd., England. Examples were given showing the large reduction in production times made possible by the new patented process, and the fact that components could be produced to a much higher standard of uniformity by mechanical methods was emphasized.

Examples given covered pipes of up to 1½-in. diameter, such sizes including the majority of pipe work required for aircraft and light engineering work. However, the scope of the process is not limited to this size of work and an interesting example of the application of the process to larger diameter pipes is shown in the accompanying illustrations, taken from *Aircraft Production.*

In this example the pipe is 2½-in. in outside diameter, with a wall thickness of 20 S.W.G., and a length of 2 ft. 3 in., the material being Tungum. There are bends in two planes, necessitating the splitting of the work into two operations carried out in separate fixtures. Fig. 1 shows the pipe in the dies at the commencement of the first operation. The pipe is, of course, carefully filled or loaded before bending, the material used being Cerrobend low melting point alloy.

Constructional details of the tools are shown in Figs. 1 and 2. They are made principally of wood and comprise an upper portion or punch, sliding in grooves cut in the lower or die portion. To avoid side movement of the pipe it is clamped to the upper bending tool or punch at the centre by a split fibre bearing which is held in position by a steel strap.

In the first operation, two bends of an S-form are imparted to the pipe, which is then withdrawn from the fixture and clamped in the second die shown in Fig. 2. Here it is located and clamped by two bridge clamp plates with hard wood pads cut to form, one of which is shown removed and resting on the top of the die. The bending tool is inserted in its slide, as shown on the left, and pressed home, so turning one of the bends already imparted into its correct plane.

The completed pipe is shown resting on the checking fixture in Fig. 3. This fixture, in addition to checking for correct form, also provides a simple method for marking off the pipe to its correct length, by reference end plates. To complete the part the Cerrobend filler is removed in the usual way, ends trimmed and nipples brazed on. The carpenter's rule gives an idea of the relative sizes of the work and tools. For the sake of clearness the pipe in the photographs is shown with the filler removed.

* *Precision Pipe Bending,* THE IRON AGE, *June 11,* Aircraft Production, *May 1942.*

Although the bends in this component are relatively simple, the saving in time as compared with handwork is very marked, production time by the Blackburn machine method being approximately one-third of the time for hand bending.

It should be noted that these times include all operations in the work common to the two methods, that is, filling, emptying, cleaning, trimming, brazing on nipples, etc., for which of course production time does not differ. A further saving accrues from the fact that the Blackburn process does not call for skilled labor.

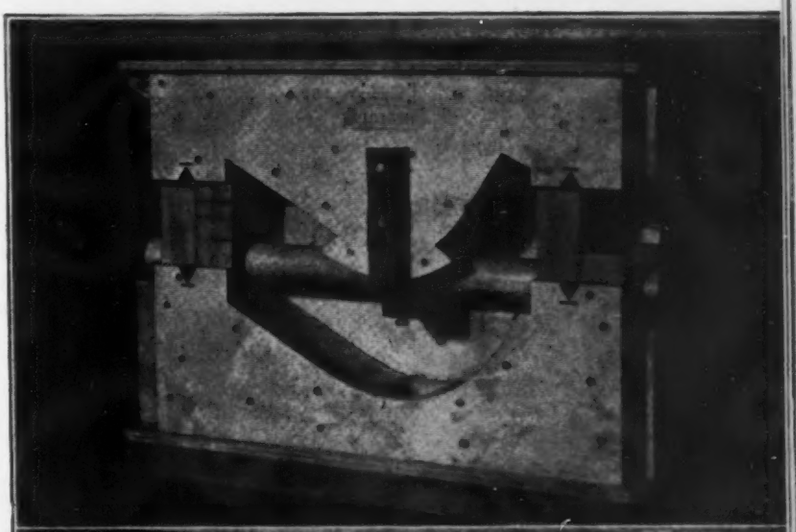


FIG. 1 — (Top) The first stage die from which two bends of S form are made.

FIG. 2 — (Middle) Bending the pipe in a second die to its completed form.

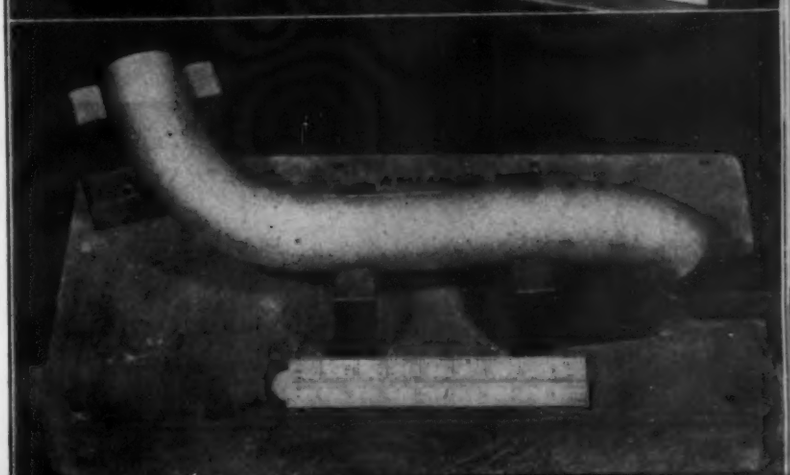


FIG. 3 — (Bottom) The fixture used for checking the bend also serves as a length gage.

Flame-Priming Method of Preparing

RESEARCH into the protection afforded steel surfaces by painting indicates that the preparation of the surface is equally as important as the paint itself. The surface, in addition to being cleaned of loose scale, rust and contaminants, should also be dry and warm, because it has been shown that as little as a single molecular layer of moisture or some other incompatible material on the surface will not only prevent satisfactory bonding on the base coat but will permit corrosion to continue after the coat has been applied (*Appendix I*). On a warm, dry surface, the paint will flow readily, continuously wetting the entire surface and carrying the inhibitors into intimate contact with the surface where they are needed for effectiveness.

While the beneficial effects of painting on a clean, warm, and dry surface have long been realized, it was not until the oxy-acetylene flame-priming process was introduced several years ago that all three of these desired conditions could be achieved. Following its introduction, flame-priming has proved its efficiency, speed, and economy in theory and practice, as evidenced by the fact that well over 20,000,000 sq. ft. of steel surfaces are now being treated by this process each month.

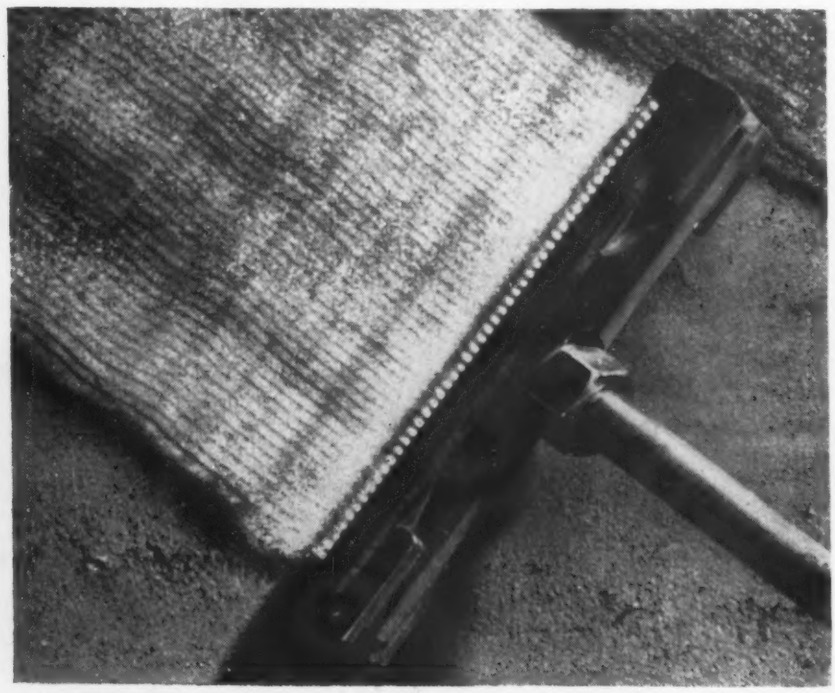
Principles of Flame-Priming

The flame-priming process consists of "scrubbing" steel surfaces with a series of closely spaced oxy-acetylene flames that have an extremely high temperature and velocity. As a result, all mill scale that is not tightly bonded is popped loose by sudden thermal expansion, and physicially adsorbed and chemically combined water are driven off from any rust that is present, leaving stable oxides in their place. At the same time other contaminants such as oil and acid salts are consumed or disintegrated by the flames. The surface is then swept or wiped free of loosened foreign material, and painted while still at an elevated temperature.

This procedure not only brings about improved corrosion resistance of the paint coating, but also increases cleaning and painting rates and reduces setting time for the paint. As a further advantage, painting can be carried out under conditions of low ambient temperature or dampness which would otherwise cause major delays. The time saved with the process is of particular importance at the present when continuous production without delays in the fabrication and painting of steel is required.

It should be noted here, that the term "flame-priming" is now designated for the process at the suggestion of many industrial users. It is felt that the word "priming" best expresses the effect of the process, not only upon the surface to be painted but because it also implies an effect upon the paint coat itself. In addition to cleaning and drying the surface, it heats the metal, thus giving the subsequent paint coat the effect of a low-temperature bake. For this reason, flame-priming would seem a more expressive term than flame-cleaning, descaling, or dehydrating. These latter terms are still widely used for those applications where no paint is applied in conjunction therewith or where it is applied at a later date.

FIG. 1—In flame-priming, loose scale is popped off and rust is dehydrated and loosened, leaving a warm, dry surface that can easily be cleaned to receive the paint coat. The dark streaks that appear on the plate surface are black magnetite, and the silvery streaks between them are sponge iron. Both are granulated products of rust that can be easily swept off the surface. Any particles that remain will be absorbed in the paint with no harmful effects.



Flame-Priming Equipment

The rigorous heating action in flame-priming is produced by flame-priming heads, ranging in widths from 1 to 12 in., which can easily be attached to standard welding blowpipes, either directly or by means of an extension arm. The entire unit, shown in Fig. 2, is light, well balanced, and easy to handle. The head is protected from wear or damage in use by means of hard-faced wear pads and skids, which also serve to keep it automatically at the correct distance from the work. A 6-in. head, the size most frequently used, has 49 flame ports that are spaced $\frac{1}{8}$ in. apart, and are No. 75 drill size, or approximately 20 thousandths of an inch in diameter. Despite this extremely small diameter, the flames are over $\frac{1}{4}$ in. long, indicating the extremely high velocity of the burning gas jets, which increases the "blasting" effect of the flames and therefore their efficiency.

Because of the high velocity of the flames and the design of the flame ports, these flames are ex-

Steel Surfaces for Painting

By E. W. DECK
Development Engineer, Linde Air Products Co.

. . . The latest findings on the increased corrosion resistance of steel surfaces that have been flame-primed before protective painting and an investigation into the chemical aspects of rust and mill scale. This is the first of a two-part article on the subject.

tremely resistant to popping or clogging under the most severe operating conditions. Technique of manipulating the blowpipe is easily learned and requires no special skill. In fact painters, with no previous experience in use of the oxy-acetylene process, have been trained in five minutes to do flame-priming satisfactorily.

The ready portability of all equipment necessary for flame-priming, including supply sources of oxygen and acetylene, makes the process equally as adaptable for use in the field as it is for shop use. In the shop, oxygen is usually supplied by a piping system and acetylene from a generator, while in the field, oxygen and acetylene are usually supplied from manifolded cylinders.

Effect of Flame-Priming on Rust

In any discussion of the effects of flame-priming on rust, some mention should first be made of the nature of this product of corrosion. Rust is an interbonded, chemical and physical adsorption of water with iron oxides (*Appendix* 2). The rust normally encountered on steel work is the wet, reddish brown precipitate resulting from the oxidation of the ferrous hydroxide that has been formed by the action of water upon iron. This precipitate is a hydrated iron oxide having varying amounts of physically and chemically adsorbed water. The physically adsorbed water is the moisture which can be seen or felt, while the chemically adsorbed might be considered comparable with waters-of-crystallization.

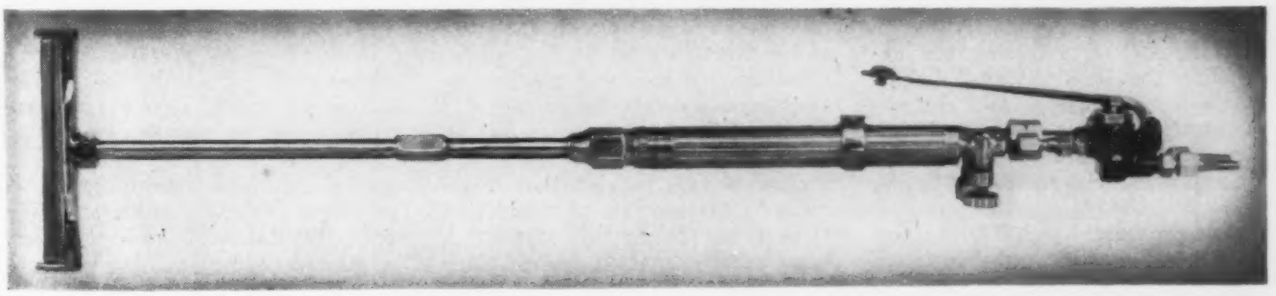
A thorough wire brushing alone is not sufficient to prepare a rusted surface for painting (*Appendix* 3), since this physical wetness causes the rust particles to adhere with a persistence that defies brushing. In flame-priming, however, depending upon the surface temperature reached and the length of time at which they are held there, a series of reactions takes place beneath the flames which reduces this wet, hydrated oxide to ferroso-ferric oxide or even to sponge iron, both of which are loosely bonded, granulated powders that can readily be brushed away.

The heat first dries out the physically adsorbed moisture, and breaks down the rust, leaving an anhydrous oxide (*Appendix* 4). Simultaneously, the reducing gases in the flames (*Appendix* 5) react chemically with the oxides to reduce them to ferroso-ferric oxides or black magnetite, which is highly stable (*Appendix* 6). The formation of this black powder, which in most flame-priming operations gives the surface its characteristic appearance, indicates that all moisture has been driven off (*Appendix* 6). Thirty years ago it was conclusively (*Appendix* 6A) proved that such a surface would be desirable for painting but at that time oven-baking was used and was not practical for most work.

FIG. 2—Apparatus requirements for flame-priming are simple, consisting of a flame-priming head attached to a standard welding blowpipe, either directly or by means of an extension arm. The flame-priming head is designed to produce a series of special high-temperature high velocity oxy-acetylene flames which produce the stringent heating necessary to remove scale.

The deoxidizing action which reduces the surface rust to black magnetite can be continued still further to reduce the surface particles to sponge-iron by moving the flames more slowly over the surface. It is only a superficial effect and occurs only in the reducing atmosphere at the tip of the inner cone flame as shown in Fig. 1. If this granulated powder be brushed lightly, it would be found that the sub-surface layers were not discolored or deoxidized. Only the moisture would have been driven off; the reducing gases would not have diffused to any great depth. Nor is it necessary that they should. Tests (*Appendix* 6A) show that dehydration alone is sufficient. The discoloration serves to indicate that the dehydration of the sub-surface is complete and thereby is the perfect index of satisfactory speed of treatment.

The warm, dry, granulated powder produced when rust is treated with oxy-acetylene flames can be swept from the surface with a light brushing. It is very porous, and, therefore, tends to pick up contaminants as soon as it cools. Because of this "activated" condition it should be either brushed away before painting or painted while hot. If it is painted hot, the absorptive characteristics insure its thorough blending into the coat where it becomes a portion of the pigment. It is of the same composition as part of the pigment used in many present day anti-corrosive coatings. In this connection it should be empha-



sized that the surface should be painted while still warm.

Effect of Process on Mill Scale

Prior to the advent of flame-priming, scale on steel surfaces was a major problem. Wire-brushing did not remove all that was loose enough to flake off as the paint coats set, and also the invisible (but nevertheless present) moisture on the surface and in the rust, set up small electrolytic cells between the iron oxide and the steel. These cells concentrated their etching action across the shortest path, the bond between the scale and the steel, and thereby continued to loosen more scale. This action is illustrated in the right hand sketch of Fig. 3.

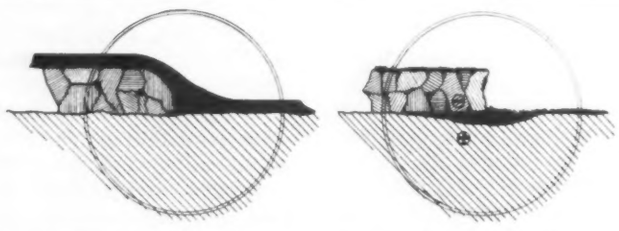


FIG. 3—Flame-priming eliminates the scale problem by removing that which is loose and dehydrating that which is tight. Tests show that scale so treated serves as a protection even when the paint coat fails.

Flame-priming not only corrects this fault of mill scale but in doing so, it renders it advantageous in that its presence prevents corrosion when the paint coat fails. In the right hand sketch of Fig. 3, the surface has been flame-primed, wire-brushed, and painted. The flames have forcibly removed all scale which could conceivably be considered loose. The paint has been applied on the warm, dry, surface with the result that its surface tension and viscosity have decreased. The improved mobility causes the vehicle to penetrate all irregularities bringing the inhibitors into intimate contact with the surfaces where they are necessary for effectiveness in the event that water eventually penetrates. Any fissures in the scale are sealed and the junction of the scale and steel receives an extra fillet of protection. In addition to this, the coating is baked by the heat, reducing voids and effecting longer life.

Should such a surface be exposed without additional coating, it is obvious that the scale would serve to protect the metal beneath long after rusting had started on the unscaled portion to the right. This is shown later by actual tests.

From this discussion it should be obvious that it would be desirable to obtain steel with the maximum amount of tight scale intact (*Appendix* 8) and paint it before any rusting could spread from the exposed area to undermine the protective layer. This, of course, is not practical, but flame-priming is the nearest artificial approach to this condition. It has been further pointed out by actual tests (*Appendix* 8A) that the less rusting which takes place before flame-priming, the more scale will be left intact and the more corrosion resistance. The U. S. Navy points this out in their specifications on this process which require that the steel be painted as soon as possible after arrival at the yard.

In flame-priming, the removal of scale results from two similar forces: Either a differential expansion between the entire scale layer and the base metal; or by the differential expansion between top and bottom surfaces of the scale. In the removal of heavy scale in which heat conductivity is low, the expanding force of even a relatively slow heating rate will cause the scale to expand and buckle off the base metal before the base metal shows any tendency to become hot.

On structural shapes and relatively thin plates that have been finish-rolled at relatively low temperatures, there usually is a good thermal bond in addition to the physical bond between scale and base metal. Consequently in its removal there is a tendency for heat to be conducted away almost as fast as it is poured into the surface. It is necessary, therefore, to supply heat to the top surface of the mill scale at a rate so high that it exceeds by far the rate of conduction away from it. In this manner, a superficial expansion takes place while the base metal and scale interface is still relatively cool and brittle. Special oxy-acetylene flames have been developed for this application. The flame ports are designed to produce exceptionally high velocity and high temperature flames capable of producing a sudden heating action with extremely low consumptions.

Flame-priming, while removing the loose scale and dehydrating rust, does not remove any scale that, because of its tight bond, would serve as a protection against corrosion. It has been shown that any scale that can resist the stringent expanding action of the sudden heating effect of high-temperature, high-velocity flames is sufficiently tight to resist subsequent flaking. In fact, to bring about a margin of safety, flame-priming actually removes some scale which could be satisfactorily left on because of its high bond strength (*Appendix* 9).

Consequently an increased protection against corrosion is effected and the causes for mill scale giving trouble under paint are mitigated, while the tightly bonded scale is retained as an added protective measure.

Appendix

(1) A. E. Schuh, Adherance of Organic Coatings, *ASTM Proceedings*, Vol. 38, 1938, p. 484.

(2) Harry Bayer Weiser, The Hydrous Oxides.

(3) J. C. Hudson, The Corrosion of Iron and Steel.

(4) U. R. Evans, Metallic Corrosion, Passivity & Protection.

(5) D. Seferian, High Temperature Welding Flames.

(6) J. W. Mellor, Deoxidation of Iron Oxide: A Comprehensive Treatise on Inorganic and Theoretical Chemistry.

(6A) J. A. N. Friend in the 1913 Carnegie Scholarship Memoirs.

(8) F. N. Speller, Pretreatment of Metal Surfaces for Painting, *Industrial and Engineering Chemistry;* Vol. 3, No. 10.

(8A) E. A. Tice. Tests Show Effectiveness of Flame Cleaning Structural Steel, *Steel*, Feb. 9, 1942.

(9) American Institute of Steel Construction, The Preparation of Structural Steel Surfaces for Painting.

Next week the author will continue the discussion of flame-priming as a preparation for steel surfaces prior to painting and will cover specifically the subjects of operating temperatures and their effects on coatings, evaluation tests, operating data and the applications of flame-priming.

Wear Measurements to 15 Millionths of an Inch

A NEW measuring method has resulted in the development of a new instrument known as the McKee wear gage which will detect wear of as little as 15 millionths of an inch on metallic surfaces. This instrument, which is a recent development of the American Instrument Co., Washington, is intended primarily for use in determining the amount of metal removed during grinding, honing or lapping, or as a result of ordinary wear. It is being applied in the production or rechecking of engine cylinders, crankshafts, bearings and other precision parts.

The method is based on the principle of measuring the width of a precision-impressed, diamond-shaped, pyramidal indentation. The depth of the indentation is a function of the peak angle of the indenter point; consequently, by measuring the width of the base of the indentation before and after wear has occurred, the depth of the indentation can be determined and the amount of wear calculated.

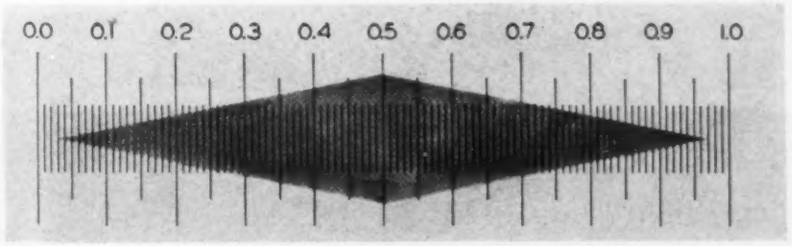
In some instances, it is desirable to know when an exact amount of wear has occurred, such as during a grinding or honing process. To do this, the instrument is used to make an indentation of pre-determined depth calculated from the amount of metal to be removed. The surface is then ground or honed only until the indentation is entirely removed which indicates that the pre-determined depth has been reached.

Another manner by which visual observation may be used to measure the amount of wear is the placing of a series of marks, each of a different but known depth, on the wearing surface. Observation of the marks at any time will reveal the amount of wear that is between two definite limits.

The particular advantage of the method, in its present application, is that it provides an indication of wear only, while the usual measurements of changes in dimensions, such as of pistons or cylinders, do not distinguish local wear or the differential between wear and such distortion as may have occurred during the test.

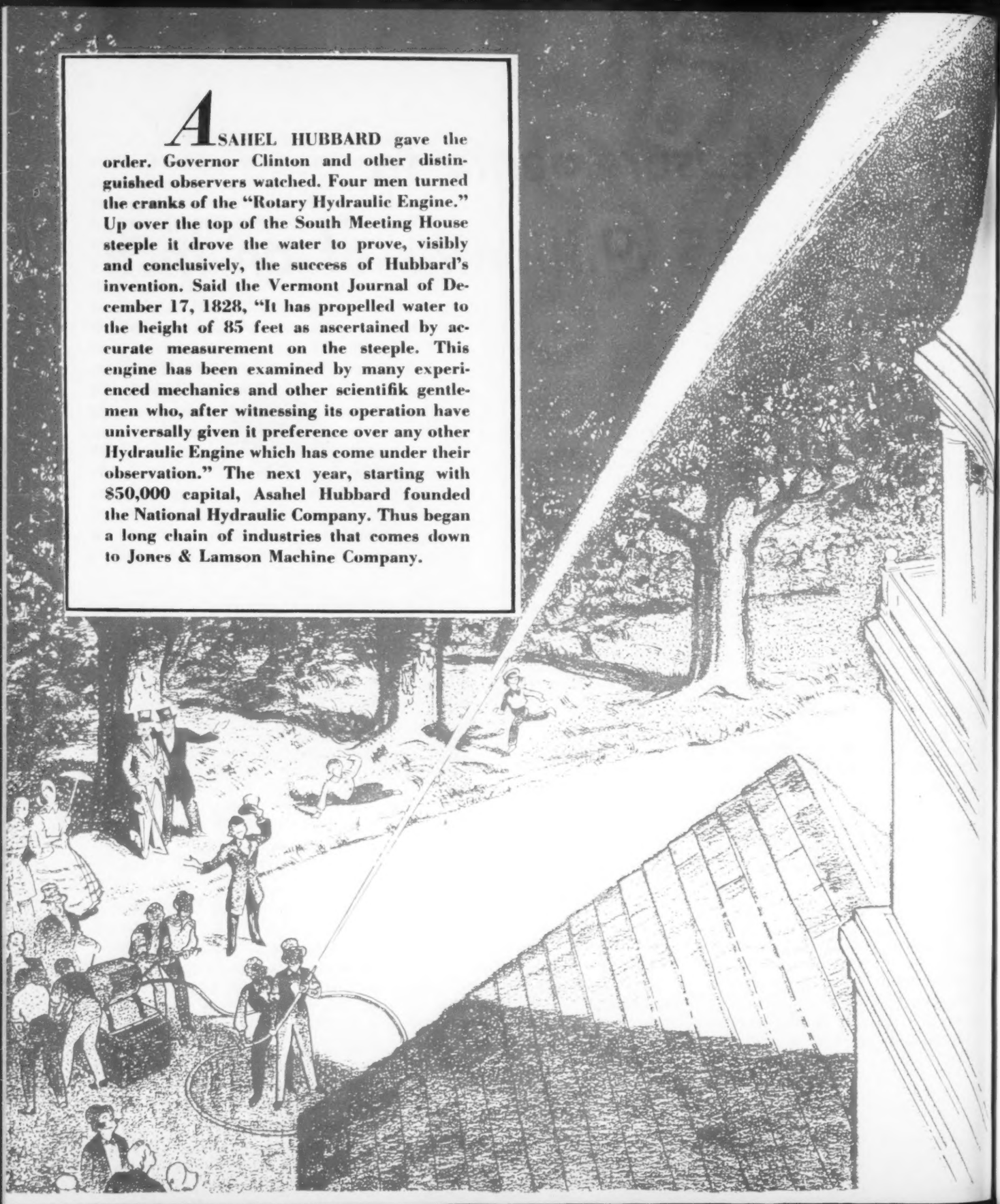
The instrument itself is not only precise within the maximum measuring limit of 0.0014 in. down to a minimum of 15 millionths in. but is also flexible and is applicable to wear measurement on the inside of cylinders at any place within 10 in. from the ends and on any accessible spot on the outer surfaces of flats, cylinders or spheres.

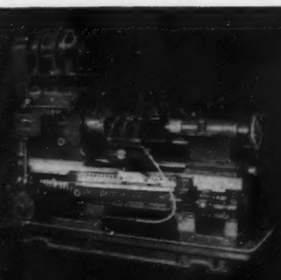
THE McKee wear gage, used for measuring metal removal in honing, grinding and similar processes, consists of four main parts: (1) the indenter, shown lying flat, (2) the measuring microscope, shown in operation, (3) the cylinder indentation locators—the rings with handles at the base of the microscope, and (4) a polishing template, not illustrated but used for smoothing the top of the indentation prior to measuring.



A VIEW of the indentation as seen through the microscope showing the visual measuring scale. A multiplying factor and correction formula are used to convert the scale readings to depth figures and correct for curved surfaces.

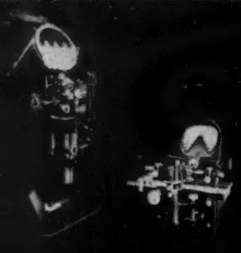
ASAHEL HUBBARD gave the order. Governor Clinton and other distinguished observers watched. Four men turned the cranks of the "Rotary Hydraulic Engine." Up over the top of the South Meeting House steeple it drove the water to prove, visibly and conclusively, the success of Hubbard's invention. Said the Vermont Journal of December 17, 1828, "It has propelled water to the height of 85 feet as ascertained by accurate measurement on the steeple. This engine has been examined by many experienced mechanics and other scientifik gentlemen who, after witnessing its operation have universally given it preference over any other Hydraulic Engine which has come under their observation." The next year, starting with $50,000 capital, Asahel Hubbard founded the National Hydraulic Company. Thus began a long chain of industries that comes down to Jones & Lamson Machine Company.





FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

OVER the TOP - in 1828

"OVER the top" might well have been the motto of the National Hydraulic Company. And this same motto might well do for the Jones & Lamson Machine Company today, but for an entirely different reason. Now we are going "over the top" on a 24-hour, 7-day week to meet the demand of the national emergency. The same willingness to work, the same disinclination to accept easy and conventional solutions as well as the same eagerness and confidence that founded this industrial community over a century ago, are continuing unabated. Whether your problem is today's production or one of adaptation to a post-war world . . . whether your company is large or small, your inquiry will receive the careful, detailed study of our engineers. Send us your inquiry today and ask for our illustrated catalogs.

JONES & LAMSON
MACHINE COMPANY

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

Springfield, Vermont
U. S. A.

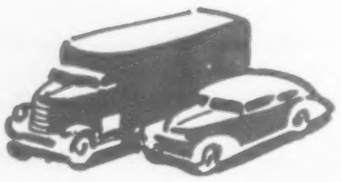
PROFIT PRODUCING
MACHINE TOOLS

SADDLE TYPE
UNIVERSAL TURRET LATHE

RAM TYPE
UNIVERSAL TURRET LATHE

Assembly Line . . .

• Auto dealers' shops pioneer in "bits and pieces" output for the armament program . . . Studebaker cases show progress and profits in rough machining work . . . Dual franchising has post-war implications.



DETROIT—South Bend, Ind., seems well on the way to becoming the focal point of the first real bits and pieces manufacturing program in the nation's war effort.

This situation began to develop last January when Studebaker Corp. started to investigate the possibilities for some of its dealers who were interested in going into war production work. The Studebaker Dealer War Production Division was formed, and its first broad effort was the publication of a 64-page booklet entitled "War Production Work for Studebaker Dealers." This was distributed to all Studebaker dealers and others on request, and met with enthusiastic reception. In no way did the book urge the entry of dealers into war work; it served rather to point out the pitfalls as well as the advantages, the necessity for experience, requirements for financing and shop equipping and pertinent information as to how to go about getting war work.

In other words, a sound basis was established for individual decision and action. At the same time, Studebaker brought field men into South Bend and gave them an intensive course in engineering principles and in background relevant to war production work, so they were able to intelligently answer any questions of dealers they encountered.

Within the past month a survey was made of approximately 40 per cent of the Studebaker dealer organization. It was found that one out of every five dealers contacted had acquired facilities suitable for war production and was processing materials or negotiating for contracts, had investigated, or was seriously interested in war work. A comparatively small proportion of this actively interested group was truly engaged in output, but the number is increasing daily and displays a marked diversity of end-products.

A BOOKLET now being distributed to Studebaker dealers cites the examples of 24 agencies, selected at random from the files, engaged in war work. Some general conclusions are possible from a study of this file. One is that for the most part a partner or owner in the agency involved has had machine shop experience. For the most part contracts were obtained through personal solicitation of prime contractors, and it must be said that very few of these contacts had ever been made before. In a general sense also, the cases reveal a fairly profitable series of operations, and general expectation that such work will continue for the duration.

Interestingly, one of the largest war production programs in a Studebaker dealership occurs in a small mid-west town of about 12,000 population, where the dealer, also operating a general garage, retailed but eight new cars in 1941.

This dealer's shop is managed by the dealer's former retail salesman and present partner, an expert machinist. Eleven machinists are employed, nine of whom had shop experience when hired. The dealer purchased some $17,000 worth of machine tools to start off his work and then obtained a contract for about $50,000. Since then, he has expanded his shop to about $30,000 in equipment and an additional $2,500 in special small tools, gages, etc. His present contract jobs are for machining and assembling steam turbine exhaust cases, costing $185 to $300 per piece for labor. The closest tolerances involved are .0005-in. Equipment in this shop consists of these machines: seven engine lathes, ranging from 20 to 47-in., six of them with cone drive, all providing tolerances to .001; a 24-in. Omer heavy duty, back geared shaper, and a 9 in. Lucas tool room shaper; a Garvin No. 14 milling machine, with 20 x 38 in. cone drive; a Prentice 42 in. radial drill press; a Bickford 22 in. post drill press; and two 20 in. Barnes drill presses. Also on the floor are two tool grinders, a 50-ton hydraulic press, welding equipment and miscellaneous other tools.

On the small side in this type of program is the example of the dealership in a mid-west city of 63,000 population where 70 new cars were retailed during 1941. This dealer had no experience in machine shop practice and employed a man to take charge of the shop who had four years as a tool and die maker behind him. Five experienced operators have been employed and four others were trained in a technical school and through NYA—one of which is a girl.

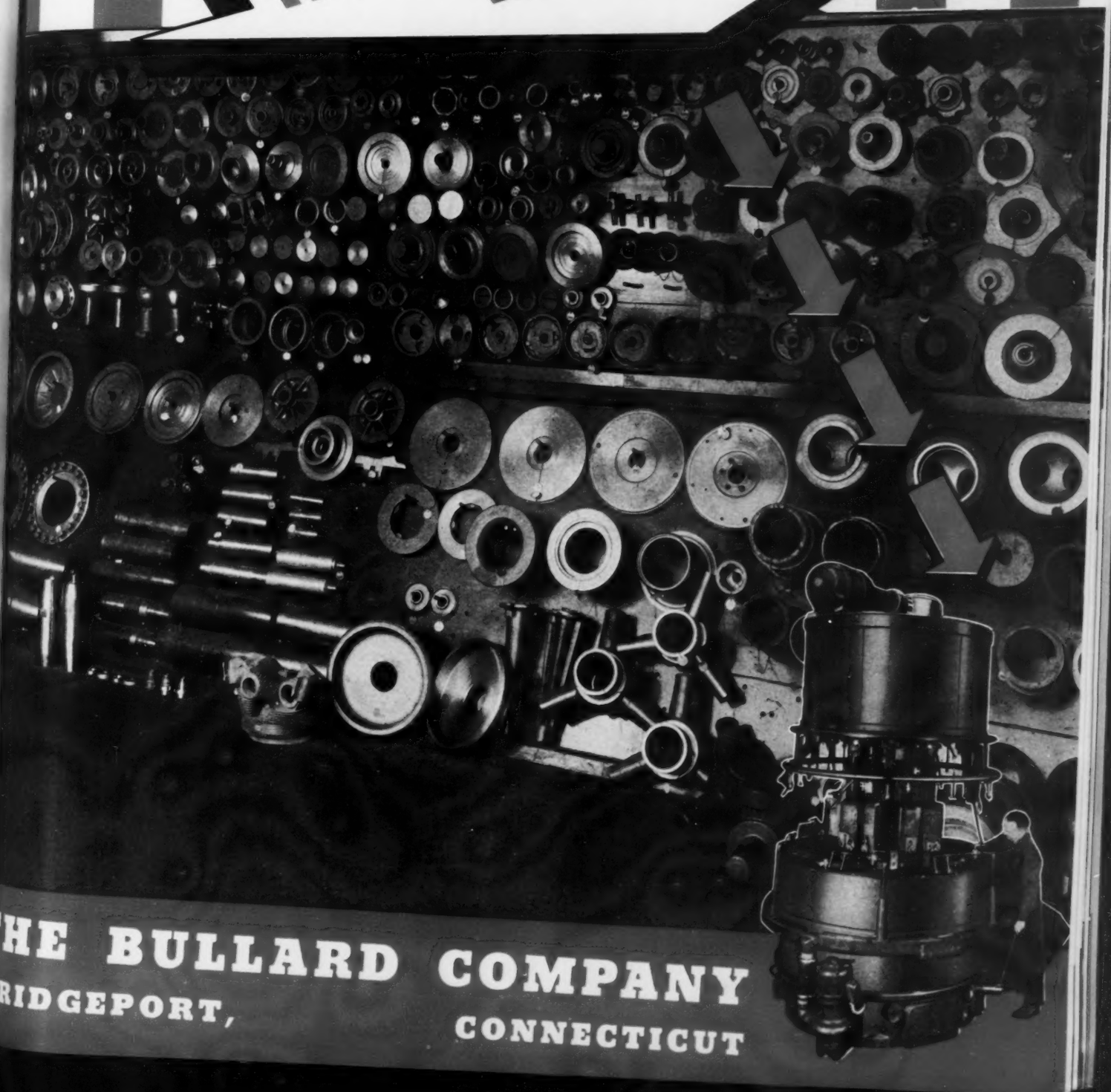
THIS dealer contacted his nearest WPB office and several automobile dealers engaged in war work. Through these sources he was able to obtain an initial contract which he could produce on his equipment. These machines consisted of the following: a South Bend Lathe with 6 ft. bed and 13 in. swing; a South Bend with 36 in. bed and 9 in. swing; an Atlas lathe with 56 in. bed and 10 in. swing; a Delta motor driven drill press; and a B & D motor driven grinder with 8 in. wheel. Good workmanship and ingenuity of the shop supervisor made it possible to turn out reasonably close work even though the equipment employed was not normally used for tolerances achieved. Punch dies used in the manufacture of small caliber shells were machined as well as other small parts, down to a tolerance of .001.

Total investment in this shop was less than $1,000 plus about $65 in special tools.

In a northeastern industrial city of 200,000, where a Studebaker dealer retailed 60 new cars in 1941, agency production operations are under the supervision of a machinist who attended a local technical school. Ten men are employed in two shifts.

An investment of about $5,000 is represented in the shop equip-

PUT JOBS LIKE THESE ON A MULT-AU-MATIC IF YOU REALLY NEED FAST PRODUCTION



THE BULLARD COMPANY
BRIDGEPORT, CONNECTICUT

ment including a Becker & Brainard 9 x 34 in. milling machine, with 3 slot table; a Bauch and Harris shaper with 16 in. stroke; five lathes, with swings from 9 to 18 in. and beds of 36 to 60 in.; a 6-hole Flatter turret lathe with 2 in. bar and 20 in. swing; a 6-face Atlas turret lathe with 10 in. swing; a 21 in. upright Boyersford drill press, up to 1½ in. capacity; a Craftsman ½ in. bench type drill press; a Doall job selector contour saw; a Sioux valve grinder converted to grind small parts to .0005 in. tolerance; a Black & Decker grinder and buffer, rigged for tool sharpening to .0005 in. tolerance; and miscellaneous other equipment.

International News Photo

FLYING FORTRESS ENGINE: Admiring glances are being lavished on the new Wright Cyclone 9, 1200-hp. engine just coming off the assembly line at the Wright Aeronautical Corp., Paterson, N. J. The admirers are (right) Myron B. Gordon, vice president and general manager of Wright and Lieut. Col. W. J. McKiernan, Air Force resident representative.

THIS dealer is doing both rough and finish machining operations on small parts, receiving about $2.50 an hour for labor, plus machine time. Two of the three contracts which were held at the time of the analysis of this operation, a month ago, were obtained by personal solicitation; the third was secured through the aid of the district WPB office. War production work in this dealership has returned a profit each month and volume of production has been gradually increasing.

Of course, Studebaker dealerships are far from being alone in their movement into war work through this period. At Detroit, the Chevrolet central offices have records of 79 retail outlets which have gone into primary and secondary armament contracting.

Detroit has a Chrysler dealership which has converted much of its service facilities to war work, through a completely integrated affiliate, Snethkamp Tool and Engineering Co. A Pontiac dealer in Detroit, Jimmie Powers, effected a tie-up with a nearby engineering concern, filled its showrooms and other space with production machinery early this year, and has been in volume production ever since.

Dealerships in scattered parts of the country are also making contributions to the war effort through training of men for skilled work. In the east one dealership has set up a welding school which is steadily supplying men to nearby aircraft plants. In California another retail car establishment is training 75 students at a clip learning fundamentals of sheet metal fabrication, riveting, blue print reading, electrical sub-assembly, final assembly and various other phases of aircraft production.

Study of the entire picture of how dealers are surviving the straitened sales times of today brings up another interesting tendency—a turn toward "dual franchising."

Chevrolet has completed a most thorough study of dealer wartime activity, finding that nearly half of its direct dealerships are engaged in some sort of supplemental business operations. And many of these have coupled their passenger car franchises with franchises to sell farm equipment at retail.

This may have significant ramifications after the war. The dealers are being advised that any such arrangements they make in the current period can carry on later as may be desired. Most of the large farm equipment manufacturers have cast interested eyes toward the prospects of utilizing flourishing automobile dealerships, thoroughly familiar with volume business and how to get it, to move their goods. The trend will be interrupted, of course, as the production of farm equipment undergoes curtailment, but it may open up a new means of future marketing for the farm machinery producers which may ultimately serve to continue and perhaps amplify the increasing dollar and unit volume of recent years.

Auto Plants' War Output Jumps 15 Per Cent in Month

Detroit

• • • **War product deliveries** from automotive plants during September are estimated by the Automotive Council for War Production to have amounted to $512,000,000. This figure represented an increase of more than 15 per cent over the previous month, comparing with revised August delivery figures of $445,000,000.

Cargo Bodies Now Wooden

Detroit

• • • **Savings of more than** 275,000 tons of steel annually are estimated to result from the adoption of wood as a substitute for steel in cargo bodies for Army trucks. Industry sources said that all trucks of one and one-half ton size and larger now being produced by automotive companies are equipped with wooden bodies.

WHERE *Power* LOAFS PRODUCTION LAGS

Throughout American Industry the New BullDog Vacu-Break Safety Switch is Helping to Keep Power on the Job . . . Speed Production—Reduce Maintenance Cost

The finest electrical distribution system in the world is no better than its switches. The right type of safety switches can keep power on the job every minute, free from current losses caused by lost motion in switch operation, by pitted or burned out contacts, by loose fitting contact devices.

The new BullDog Vacu-Break Safety Switch is that right type of switch, designed to meet today's emergency needs, to carry the loads of round-the-clock production schedules, to stand the wear and tear of *constant* operation and lack of adequate maintenance time.

Industry has been quick to see the advantages of the New Vacu-Break Switch—hundreds of the country's greatest war plants are specifying it as standard equipment, sure of its ability to "stand the gaff."

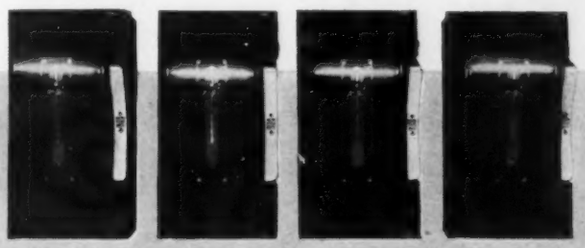
Cut-away view of new formed Bakelite arcing chamber shows how snugly the clamping pressure contacts fit therein.

PLUS FEATURES OF THE FRONT OPERATED VACU-BREAK SAFETY SWITCH

1. **"*Clampmatic*" SWITCH CONTACTS:** Provide in a very simple way, "Clamp type pressure" when switch contacts are closed, and at the same time, the switch operates more easily and quickly than switches having only ordinary pressure contacts.
2. **QUICK ACTION MECHANISM:** Assures positive "ON" and "OFF" operation. Provides front operation and enhances modern streamlined appearance.
3. **FORMED BAKELITE "ARCING CHAMBERS":** Confine arcs — prevent burning and pitting of contacts. Rugged current-carrying parts reduce maintenance and replacements.
4. **SIMPLIFIED OPERATING MECHANISM:** Greatly reduces parts necessary for smooth, positive and firm operation. No "lost motion" in operating mechanism.
5. **WIRING ROOM—AMPLE yet COMPACT:** The neat trim condition of switch interior is designed to provide maximum wiring space without sacrificing overall compactness.

Available in Master (Type A) and Standard (Type C) 30 Amp. to 200 Amp. inclusive

BUY WAR BONDS AND STAMPS



Rocker type handles positioned inside lines of cabinets enhance their fine streamlined appearance.

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN

BullDog Electric Products of Canada, Ltd., Toronto, Ontario

Field Engineering Offices in All Principal Cities

MANUFACTURERS ALSO OF SAFTOFUSE PANELBOARDS, CIRCUIT MASTER BREAKERS, SWITCHBOARDS, BUS DUCT SYSTEMS—FOR LIGHT AND POWER

Washington . . .

• Industrial salvage drive will include calls on over 70,000 companies before end of this year in order to build stock of scrap for winter months.

WASHINGTON—The WPB Salvage Section, headed by Hamilton W. Wright, is completing coordination of its 3128 field representatives in connection with its drive to expedite the flow of production scrap and to obtain the maximum dormant scrap from all industrial companies throughout the country.

This nation-wide campaign, supported by steel companies, the American Steel Warehouse Association and the National Federation of Sales Executives, involves calling on over 70,000 companies by the end of the present year. It is from this industrial scrap, dormant and production, that the great bulk of purchased old material is gathered to keep the furnaces going. It represents about 70 per cent of all scrap collections, which, with home scrap, are used in the production of steel. The importance of gathering household scrap, being so successfully done as the result of the splendid daily press campaign, and of salvaging old automobiles is great, yet the outstanding source is industrial scrap. About 10 per cent each comes from homes, farms, municipal governments, etc.; special projects, buildings, bridges and abandoned tracks; and auto graveyards.

Thus assuming a total of 35,000,000 tons of purchased scrap during the current year, it is estimated that industrial scrap will constitute about 24,500,000 tons and the other grades approximately 10,500,000 tons. In turn it is estimated that dormant scrap—unusable obsolete machinery, tools, equipment, dies, jigs, fixtures, etc., gathered from plants, mines and other sources—will total about 15 per cent or about 3,675,000 tons of all the purchased industrial scrap, the major portion of about 14,825,000 tons being "production" scrap recovered from fabricating steel into finished form.

THE cost of some of this old material is often going to greatly exceed OPA ceiling prices. This means that it will have to be purchased by War Materials, Inc., with its holding company, the Metals Reserve Co., absorbing the excess above the fixed maximum prices. War Materials, Inc., was set up with this purpose in view in proceeding with a plan to purchase and sell to steel mills a minimum of 5,000,000 tons of iron and steel scrap. Since its emasculation it seems that the capably staffed War Materials will be permitted only to purchase scrap and will not, as it had been originally announced it would, have charge of salvage work.

Under its organization, the WPB Salvage Section has assigned each of its representatives to a list of companies. After each has made

PRODUCTION BOARD MEETS: For the first time members of the newly created Production Executive Committee, formed by Donald M. Nelson, meet thus joining the forces of the WPB, Army, Navy, Army Air Forces, and the Maritime Committee in a program to maintain constant check and control on the production program. Left to right are: Rear Admiral Howard L. Vickery, vice chairman, U. S. Maritime Commission; Lt. Gen. B. B. Somervel, Commanding General Services of Supply; Charles E. Wilson, new vice chairman of WPB; Vice Admiral Samuel M. Robinson, director of Material and Procurement; and Maj. Gen. Oliver P. Echols, Commanding General, Material Command.

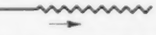
International News Photo

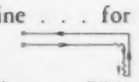
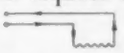
Left: Milling a machine gun part on a CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine. (Write for Catalog No. M-965). Note the projecting lugs at the ends of the part.

Right: A high production Index Base set-up, on a CINCINNATI No. 2-24 Plain Automatic Milling Machine. (Write for Catalog No. M-909). Milling radii on connecting rods, production 50 rods per hour.

A Few Tips ON PLAIN AUTOMATIC VS AUTOMATIC RISE AND FALL MILLING

THE general characteristics of the two milling machines illustrated here mark them as being similar in many respects—both are automatic types. However, there is one noticeable difference; the machine at the left has an additional unit above the spindle carrier, giving it the capacity to mill in *two directions—horizontally and vertically,* while the other machine mills in one direction only—horizontally. Each machine is suitable for a definite type of work.

Choose the Plain Automatic (right) for the type of work which can be milled by advancing it horizontally into the cutter, like this:  These set-ups, which, incidentally, are the more numerous, must have no projecting lugs or clamps in the path of the cutter.

Choose the Automatic Rise and Fall Machine . . . for work which requires cutting cycles like this:  or this:  or a combination of the two. This type of set-up may have projecting lugs or clamps in the path of the cutter. The work may require a horizontal cut only, a vertical cut only, a vertical and then horizontal cut, two accurately spaced vertical cuts, and many more combinations.

If your medium sized parts can be milled on an automatic bed type miller, a brief classification analysis as outlined above will determine whether you should use a CINCINNATI No. 2-24 Plain Automatic or a CINCINNATI No. 2-24 Automatic Rise and Fall Miller.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING MACHINES

four calls in 90 days reports are to be sent to Washington on the amount of dormant scrap which each individual plant has shipped either to scrap dealers for sorting and preparation or direct to consumers. The quantity sent direct to mills is comparatively small and is limited principally to big producers who maintain their own equipment and yards for the segregation and preparation of scrap. The final reports of the Salvage Section field representatives are expected to be made about the middle of November. They will reflect fully the achievement of this extremely important drive and therefore give a pretty good index to the year's steel production.

THERE have been predictions that output for 1942 will fall 5,000,000 tons below capacity due to the scrap shortage. If ingot capacity is 90,000,000 tons, as the trade commonly estimates, that calculation is not far off, when based on output of 64,000,000 tons for the first nine months. At this rate over the remainder of the year the total output would be approximately 85,332,000 tons, but actually the rate has been stepped up, in the face of cries of scrap shortage, and last week it rose to 100 per cent, the year's highest since the week of last April 30, as pointed out in THE IRON AGE of Oct. 15. This all-time high ingot output if maintained, as it might be, if it isn't actually increased further because of intensified scrap collections, would cut down considerably the estimated drop of 5,000,000 tons below capacity.

The industrial scrap drive brings increased tonnages to the mills in a short time because most of it is high grade in quality, easily segregated, and prepared and fairly well concentrated for shipment, facts that are not true of household and other miscellaneous grades. So by rushing increased quantities of industrial scrap to the mills, one purpose of the Salvage Section, the 1942 output may yet turn out to be considerably above earlier estimates. The Salvage Section hopes to see 7,000,000 tons of scrap for steel mill yards on Jan. 1 to carry steel production through the winter months.

There is still another source of scrap recovery being considered. This relates to shipments from England. It has been in the talking stage for some time, and may never get beyond that, but both steel producers and scrap dealers think scrap recovered from American steel should be sent back to the United States. It could easily be shipped as ballast, and it would relieve the scrap shortage without hurting the British industry since it is reported to be comfortably supplied with scrap. As a partial alternative, suggestions have been made that only semi-finished and finished steel be exported, thus salvaging ingot crops for the American steel industry.

Harris & Ewing Photo

OES DIRECTOR BYRNES: Newly appointed Director of Economic Stabilization, James F. Byrnes, photographed for the first time since his appointment. Mr. Byrnes was formerly an associate justice of the U. S. Supreme Court.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

ME GO BACK INTO TH' SHOP? HA HA! AFTER TH' WAY YOU THREW US OLD GUYS OUT WHEN THAT CRAZE WAS ON FER YOUNG MEN! I AIN'T FERGOT-- AND YOU'LL HAVE TO DRAFT ME!
AH, THIS IS NO TIME TO HOLD A GRUDGE, DICK-- WE'RE AT WAR!
BAH! I WOULDN'T WASTE TIME ON A BULL-HEADED, STUBBORN OL' COOT LIKE HIM!
WELL, WHEN YOU HAVE TO WAIT FER A WORLD WAR TO BE SOMEBODY-- WHY, YOU JUST LIKE TO BE SOMEBODY, IS ALL!
COPR. 1942 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.
THE DRAFT AGE
J.R.WILLIAMS 10-23

Tracy Quits As Head of Farm Machinery Branch

Washington

• • • **William R. Tracy** has resigned as chief of the WPB Farm Machinery and Equipment Branch to accept a position in the Motor Transport Division, War Dept.

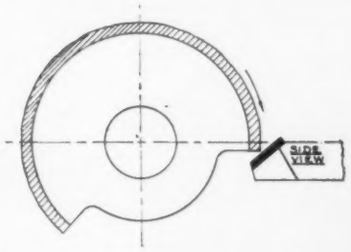
DO'S AND DON'TS FOR OPERATORS USING CARBIDE TOOLS

Carbide tools are as easy to use as ordinary types of tools. However, because carbide tools are extremely hard—and therefore more "brittle" than steel tools, certain requirements are necessary in order to protect the carbide tip while in use. When properly used, carbide tools will give you long, continuous periods of cutting, they provide high quality finish, extreme accuracy, and freedom from frequent tool changes. Here are some of the things you can do to get the most from your carbide tools.

Handy charts containing these hints are available free on request.

New Standard-Design Shear Type Tools

For interrupted cuts on large forgings and castings, the standard-design shear type Carboloy Cemented Carbide Tool illustrated has several outstanding advantages. Designed to protect the carbide tip on this heavy work, this tool takes the



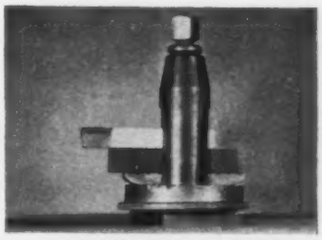
initial load at a point some distance behind the nose, where the tool is stronger. The heavy shear angle causes the cutting edge to literally "slice" into the work, thus reducing impact to a minimum. See new catalog GT-142, page 9.

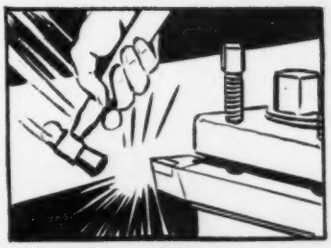
Standard-Design Tools Save Delivery Time

To enable you to order by tool number and eliminate delays for drafting, blueprints, quotations, etc., Carboloy Company now makes available a large selection of standard-design tools. These are former special tool styles for which there previously has been a large demand within a narrow range of minor design variations. Standard designs for these have been established to broadly meet most previous requirements. Standard-design tools represent one of several time-saving features described in the new catalog GT-142. Send for your copy.

◀ When using holders, use special ones designed to hold carbide tool on a horizontal plane—not tilted upwards.

Don't tilt rocker ▶ holders up. Keep tool level and shim up to centerline. Better yet, turn tool post collar upside down to get flat surface.



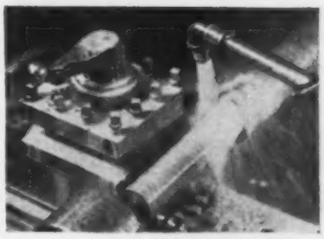


◀ Don't hammer cutting edge of carbide tools. Blows cause chipping. If necessary, tap tool from rear to bring up to work.

Avoid excessive ▶ tool overhang. It should be no more than necessary to allow work clearance and chip room.

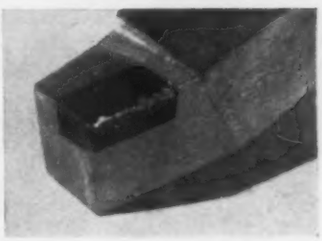
◀ Don't use sharp-pointed or cup-type screws. Grind them flat—using the flat face of a cup-type grinding wheel.

When a coolant is ▶ needed—use a *heavy* flow directly onto tool. During tool adjustments, avoid turning coolant on and off. If necessary run first piece dry.



◀ *Always* disengage feed first before stopping machine. Never stop tool in the cut. This will cause tool breakage.

Remove tool be- ▶ fore it becomes excessively dull, or chipping may result. Best way is to remove tools for sharpening at regular intervals.



CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brands of cemented carbides

11153 E. 8 MILE ROAD, DETROIT, MICH.

Chicago • Cleveland • Los Angeles • Newark • Philadelphia

Pittsburgh • Seattle

Canadian Distributor: **Canadian General Electric Co., Ltd., Toronto, Canada**

WEST COAST . . .

• WLB seeks to determine whether 96.4c. an hour is sub-standard living . . . Ten per cent of Coast war plant workers are off job every day . . . War vehicle order holds up needed tractor parts.

LOS ANGELES—Is 96.4c. per hour an hour an average earning which provides only a sub-standard living on the Pacific Coast? That is the gist of the question on which a panel designated by the War Labor Board, and headed by Paul R. Porter, conducted hearings here last week. Parties to the hearings, which were conducted behind closed doors, were nine Pacific Coast air frame manufacturers and their organized employees, as represented by the AFL International Association of Machinists and the CIO United Automobile, Aircraft and Agricultural Implement Workers of America. Testimony was also presented by the National Union of United Aircraft Welders of America, an independent labor organization which represents some employees at four of the plants.

By a nice piece of alphabetical sleight of hand, the War Production Board, before the hearings started, tossed to the War Labor Board the tattered fabric of the previous ill-fated aircraft stabilization conference which dispersed in confusion on July 16, and bade the War Labor Board to take up the raveled threads of this previous negotiation.

Specifically, the War Labor Board hearings last week were originally scheduled to deal with wage disputes involving Vultee and North American and the CIO United Automobile Workers. Upon Chairman Porter's suggestion, these hearings were merged with the general wage determination previously pondered by the July stabilization conference, and all nine aircraft companies and both labor organizations previously involved were invited to present evidence.

From the standpoint of authority as a wage determining body, the new arrangement demonstrates conclusively that the War Production Board has completely relinquished whatever half-hearted power it ever held to the War Labor Board. Apparently with the disappearance of soft spoken, heavy footed Sidney Hillman, and more conclusively with this month's wage freezing act, the War Production Board has lost all real power in the labor picture except to form plant committees and judge slogans.

AS a sort of beacon to guide the hearings, Chairman Porter quoted what he called "significant sections" from the wage freezing order:

"1. No increases in wage rates, granted as a result of voluntary agreement, collective bargaining, conciliation, arbitration or otherwise, and no decreases in wage rates shall be authorized unless notice of such increases or decreases shall have been filed with the National War Labor Board, and unless the National War Labor Board has approved such increases or decreases.

"2. The National War Labor Board shall not approve any increase in the wage rates prevailing on September 15, 1942, unless such increase is necessary to correct maladjustments or inequalities, to eliminate sub-standards of living, to correct gross inequities, or to aid in the effective prosecution of the war."

Then Chairman Porter himself added, "The determination by the National War Labor Board will, of course, be made within the framework of the policy set forth in the President's executive order."

As a statement of policy, that introduction was as lofty as the alpine edelweiss of Switzerland, but as full of holes as that country's celebrated cheese.

The legal minded might be inclined to point out that the specific wage determinations with which the hearings dealt involved renewal of contracts at Vultee and North American which had expired months ago and which, presumably, would not be affected by the September 15 freezing date, inasmuch as any wages which might be decided upon would be retroactive.

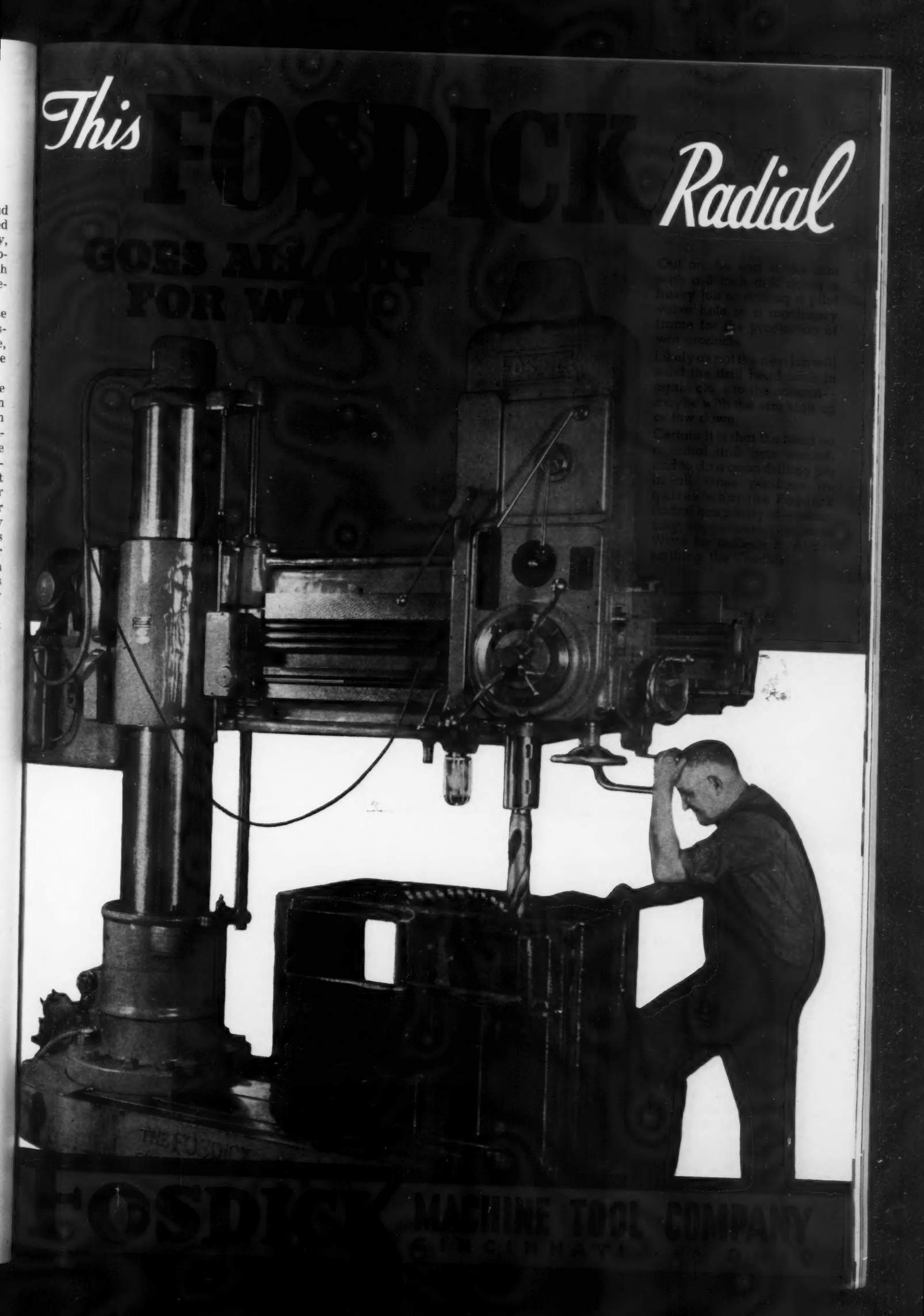
The CIO element, however, chose for its particular holes the question of inequalities. For instance, the stated CIO proposals ran like this:

"1. Equalization of basic wage rates of the aircraft industry upon a national and regional basis. In line with the policies of the President of the United States and the War Labor Board, gross differentials between California aircraft rates and aircraft rates in other sections of the nation or in other parts of California's war industry must be eliminated. This means the establishment of a 95 cent per hour minimum and $1.65 maximum for aircraft workers. Such levels must be made retroactive to July 6, 1942.

"2. Elimination of the present inequitable and haphazard system of job classification for wage payment. The principle of 'like pay for like work' must be applied for every man or woman employed in the industry.

"3. The establishment of a fair system of night shift premium and vacation pay. This must be worked out in line with established practice in organized industry."

Compared with the average hourly earnings for all workers in California durable goods industries, the 96.4c. per hour of the air frame and parts industries is "sub-standard" if sub-standard means below the average of other durable goods workers. According to the Division of Labor Statistics and Law Enforcement of the California State Department of Industrial Relations, durable goods workers average $1.105 per hour; the average for all manufacturing industries is $1.039. The average is boosted materially, of course, by the average of $1.321 per hour paid in shipbuilding and repairing. It should be emphasized that these figures are average hourly earnings and are not basic wage rates. On the other hand, if "sub-standard" is interpreted to mean wages which did not afford a decent standard of living, it is doubtful if aircraft


This FOSDICK Radial
GOES ALL OUT FOR WAR!
FOSDICK MACHINE TOOL COMPANY

workers can qualify. Past War Labor Board rulings give little indication that this latter interpretation will be followed, however, and by the time this reaches print, the public daily press may have again carried news of another War Labor Board submission to the principle of higher wages.

CHAIRMAN Porter's request to the conferees that no statements be issued by them regarding the proceedings at the hearing marked a prudent step on his part to prevent debate in the public press by labor, management and various government agencies which contributed heavily to wrecking the July conference with consequent damage to Porter's reputation as a top flight labor mediator. With everything worked out behind closed doors, it is not improbable that a higher wage standard can be set under which the chief bill-payer is Uncle Sam, the industry's sole customer. With no one present solely to take the part of the old gentleman with the striped pants and the spangled hat, it should be no great task to reach a satisfactory settlement.

To Pacific Coasters with a colonial complex, the fact that the local hearings are only preliminary and that final hearings will be held in Washington, D. C., gives further cause for apprehension.

The War Labor Board hearings, as such, concern only wages. Following thrashing out of wage matters, the meetings will adjourn for a change of costume and reconvene cloaked as a continuation of the old Aircraft Stabilization Conference, considering such other labor matters as union security.

Another facet of the manpower problem last week reflected efforts to cut down absenteeism by workers. It took State CIO President Philip M. Connelly to summarize succinctly the reason why ten per cent of all California war plant workers are voluntarily absent from their jobs every day.

"They are not sick," he said. "They maybe think they are making pretty good dough and they lay off a day or so to go fishing or see Aunt Mary or something like that. They don't know they have to hit the ball every day."

Several Arizona mining communities are hitting this particular ball, however, by battling Demon rum. Saloonkeepers in these communities voluntarily close their doors at six P. M. every Sunday evening, not to reopen until Monday noon. In the first weeks the experiment was tried, Monday absenteeism decreased approximately 50 per cent.

Difficulties encountered by Pacific Coast tractor owners in securing repair parts for industrial track-type machines has been traced through undeniably authentic sources to issuance of a military order for 20 million dollars' worth of parts from a principal manufacturer in the field. This order will take four months for the factory to fill and will be the equivalent of an 18 months' parts stock for machines operated by the military branch concerned. The tractor manufacturer, itself, has always considered a three months' stock, or one-sixth of the military inventory ordered, to be sufficient to handle all needs of its world-wide customers.

This particular situation had a Seattle counterpart in which five tractors were ordered along with enough parts replacements for ten; the parts order totalled several thousand dollars more than the cost of the new tractors. At another point in the Western combat zone more parts were ordered to serve as stock replacements for ten tractors than a local dealer had carried normally to serve 40 machines operating under similar conditions.

Thus, indications are prevalent that shackles on over-ordering by the military in raw materials have not remedied poor inventory control in fabricated items, potentially with just as serious implications for the country's industrial economy.

No relief is yet in sight for Pacific Coast warehouse stocks, which are estimated to be approximately 225,000 tons short of normal. In central California alone, it is estimated that 75,000 tons of assorted steel items would be required to restore stocks to normal. Of this total, 25,000 tons is merchant bars, and 15,000 tons plates.

Revision of OPA scrap price ceilings to permit payment of remote area differentials for scrap originating in the backwoods areas of California, as previously predicted in this column, has lent considerable encouragement to scrap collection. Material now in some sections is coming in faster than dealers are able to process it, and allocations to Midwestern mills are said to be pending.

Ryan Aeronautical Co., San Diego, announced with Navy approval that it is building a new model long range naval scouting plane on production scale. The plane, designated as the SOR-1, is a two-seater midwing monoplane developed by Curtiss-Wright Corp. Previously Ryan's production has principally been devoted to Army training planes.

VICTORY LINE-UP: Both men and women, working side by side, man the machines that are turning out parts for America's bombers at Ford's Willow Run plant. This drill press line shows wives and mothers doing the same work as men and producing for victory.

Official OWI Photo by Ann Rosener

FOURTH monthly world record in pig iron production made in 1942 by a single blast furnace stack is claimed by [redacted]. Its [redacted] stack at [redacted] poured 44,659 net tons of iron in August.

The previous record was set by [redacted] stack of [redacted] in May, with 43,866 tons. Until this year No. [redacted] stack of [redacted] at its [redacted] works held the record at 41,701 tons, established in July, 1931. The first mark above this tonnage was made in January, 1942, by [redacted] stack of [redacted] at [redacted], with 41,782 tons. This was followed in March by a new mark of 43,478 tons, made by [redacted] furnace of [redacted], at [redacted].

The new record holder was completed in November, 1941. It has hearth diameter of 27 feet. It consumes 2900 tons of iron ore and 1300 tons of coke per day. It is tapped five times per day and gives an average daily output of 1440 tons of pig iron.

ARTHUR G. McKEE & COMPANY congratulate the holders of the new world's record for one month's pig iron production.

Significant of the value of McKee engineering is the fact that McKee design was employed in each of the four plants which have broken pig iron production records during 1942.

Arthur G. McKee & Company

Engineers and Contractors

2300 CHESTER AVENUE • CLEVELAND, OHIO

30 ROCKEFELLER PLAZA, NEW YORK, N. Y. • COMMERCE BUILDING, HOUSTON, TEXAS

Fatigue Cracks

BY A. H. DIX

Amateur Scrappers

> Your proposal for amateur scrap-sorting soirees reminds me of Dan Beard's directions to boys for making a telegraph instrument. Get a job mowing lawns, he advised, and save your money until you have enough to buy one.
>
> If you set up this project, I predict that you will require (1) an ambulance in constant attendance, with someone who really knows first aid—not any of your 28-hour wonders, (2) plenty of tough straw-bosses to keep the boys from playing with the junk they find instead of working on it, (3) a circle of guards to frisk the departing workers and shake them down for the things they are trying to carry away and repair, and (4) at least one practical scrap dealer to keep the boys from making the stuff worse instead of better.
>
> —*Deac*

Even though we are only a typewriter scrap strategist, we do not intend to stand by idly and see our brainchild kicked in the teeth, although at the moment we will confess that we do not know what to do about it. Our resistance is low and we are out of breath, having almost lost the decision to an old bedspring we lugged out of the attic last Saturday. It has always seemed to us that there is nothing so lacking in Achilles heels as an old bedspring, and the job of reducing it to charging box proportions appalls us.

This, together with Deac's gripe, makes us suspect that we have conceived a homunculus. Our only consolation lies in the fact that the Brooklyn Navy Yard's salvage expert has also suggested training civilians in sorting and preparing the fruits of municipal salvage campaigns.

Double-Decked Horse Cars

• • • Speaking of scrap, we noticed in the Nov. 15, 1877, issue an item concerning that brave new venture, the construction of an elevated railroad. Your favorite family journal reported at the time:

> . . . the next question will be as to the right of the Sixth Avenue Horse Car Co. to run double-decked cars too high to pass beneath the elevated tracks.

"Do they own as high up as the moon," asked the LaGuardia of the day. "And if so, may they not as well insist upon carrying on their cars a flagstaff, say, 80 feet high?"

As you know, the horse cars lost the decision, and so have three of New York City's four "els." The fourth is already feeling the open hearth's 3000 deg. breath on its neck, and we are afraid the end is not distant. This will grieve us, for one of our delights is an occasional ride to work on the Third Ave. elevated, from the Brooklyn Bridge, through the Bowery and other less favored portions of this journal's home town. Peering into the rooms of the 25c. a night hotels gives us a great deal of innocent pleasure, and we think how fortunate their inhabitants are, with oil at 8.7c. per gal. and no gnawing fear every time the arrow gets down around one-quarter full.

A Night at the Show

• • • As this is written, we have spent only three hours at the National Metals Exposition, and although the brains department will cover the convention for you in its usual competent manner, we feel we should pass on to you a few of its glints in our lay eye.

We saw a spot welder with refrigerated electrodes, frosted far more than a mint julep. We listened to Frank Gepfert complain happily over the crowds in the Black Drill booth, watching holes drilled with the greatest of ease through files, nitrided parts, armor plate and other hardened materials.

We aimed the anti-aircraft gun in the Cleveland Ordnance exhibit, and marveled at the "before and after" board in the same exhibit, showing specimens of ordnance parts and the savings made by redesigning, and gasped at the catholic interpretation of the term "stampings," which we saw applied to castings, forgings, and machined parts.

We were re-impressed with the hospitality of Clevelanders. After the show, with some of our fellows, we stepped into the Hollenden bar to expel the show's fumes from our lungs, and happened upon a lonesome stranger who insisted upon paying our bar bill. This seemed unfair, as there were six of us and only one of him. All he asked in return was that we sing "Red Sails in the Sunset" with him. This seemed a small thing to do, so we obliged.

Rose, with Small Thorn

> *I doubt the existence of idiom or grammatical variation permitting the use, on page 57 of your July 23, 1942, issue, of the word "nor" in conjunction with "neither," even allowing for some of the language embellishments which you—our cousins—apply to our common tongue.*
>
> *It is a minor point, but serves at least to provide me with an opportunity of acknowledging the value of your issues which, you will be glad to learn, continue to reach this side, even though with unavoidable irregularity.*
>
> *F. T. Warren,*
> *Baldwins, Ltd., London*

The bouquet we accept, but the thorn we reject, not because we doubt that in the heat of creation the brains department might neglect the nicety of combining *neither* with *nor*, but because *neither* does not appear on page 57 of the July 23 issue. If Mr. Warren can point it out to us we promise to eat the page in Fleet Street at high noon some fine day after the war. If he can't find it we will call upon him to masticate it while seated on the verdigrised lap of Horace Greeley in City Hall Park.

Spencerian Department

• • • Most of the specimens in our collection of illegible signatures are either of the up-and-down or sprawling variety. The circular type is rare, and we are happy to report that we have just captured one. This is it:

It cloaks the name of the director of purchases of the Empire Ordnance Corp., Wissahickon, Philadelphia —Harold Wieland, who has just written in for two copies of the 56-page Priority Guide, which is going, as the saying is, like hotcakes.

Down by the Winegar Works

Two of the young lady members of the brains department, Mlles. Barmasel and Butzner, attended the ceremony at which the Rustless Iron & Steel Co., Baltimore, was given the Navy "E", and later were shown through the plant by an operating executive. Upon approaching one department a strong odor of vinegar was detected, and one of our young ladies said, "I suppose we are nearing the pickling department." "Hell, no," said their guide, "that's the vinegar factory next door."

Puzzles

The blanks in last week's poem should be filled in with *vile, evil, veil, Levi, live.*

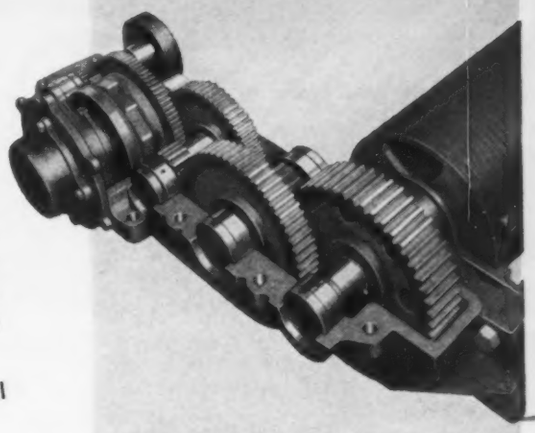
Thomas Cannarella is responsible for this:

> *Find the dimensions of a cylindrical quart can, so made that the amount of tin plate shall be a minimum.*

You may never do this on a *Northern* HI-LIFT HOIST

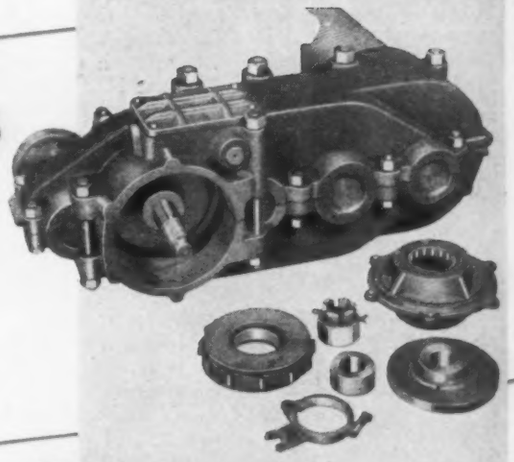
A Northern Hi-Lift Hoist will serve for years without requiring any attention to the gear mechanism. The design and construction forestalls wear. Gears are machine cut, heat treated steel—shafts are turned and ground steel. Roller bearings are of ample size, and the whole mechanism is splash lubricated.

But if you do have to open the case, note that it is an easy job—and all parts are immediately accessible.



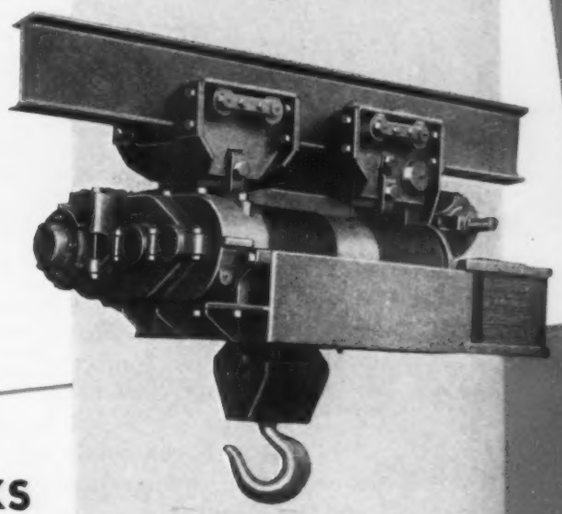
Mechanical Load Brake Renewals are infrequent but easy

The Northern Mechanical Load Brake is a rugged, long-lasting mechanism. But all brakes have wearing surfaces which must be renewed at intervals. You can do it very easily on the Northern Hi-Lift Hoist—just loosen a few bolts, and the brake mechanism is removed without disturbing the gear case.



Delivery on Heavy and Light Duty HI-LIFT HOISTS

Northern Hi-Lift Hoists are built in 1000 lb. to 15-ton capacity—in single motor and two-motor types. Two-motor hoists may be fitted with cabs. We are in good position to make excellent deliveries on all commonly used types.



NORTHERN ENGINEERING WORKS

General Offices: **2607 Atwater St., DETROIT, MICH.**

NORTHERN CRANE & HOIST WORKS, Limited • WINDSOR, CANADA

Offices at—44 Whitehall St., NEW YORK • 547 Union Trust Bldg., PITTSBURGH • 53 West Jackson Blvd., CHICAGO • 2428 Spring Grove, CINCINNATI • 4135 Gratiot Ave., ST. LOUIS • 913 South 38th St., BIRMINGHAM • 5724 Navigation Blvd., HOUSTON 1679 University Ave., ST. PAUL

Write for New Catalog of Hi-Lift Hoists

Dear Editor:

ELECTROLYTIC TIN PLATE

Sir:

An article entitled "Food in Cans" by T. W. Lippert was published in your April 30, 1942, issue. I would be extremely obliged, if it is possible, to obtain two or three copies of the reprint of this article, or, failing this, to receive copies of THE IRON AGE of the date in question.

Will you be good enough to let me know whether this will be available to me and, if so, I shall be pleased to forward you any expenses in connection therewith.

F. J. BLYTH,
British Raw Materials Mission, Washington, D. C.

• It is possible. Reprints are available and have been sent you.—Ed.

NE STEELS

Sir:

Your article in the September 17 issue on "The Physical Properties of NE Carburizing Steels" by A. S. Jameson has been read with great interest.

May we have a copy of this data for our reference files?

B. G. ERIKSON,
Asst. Purchasing Agent
Signode Steel Strapping Co., Chicago, Ill.

PRIORITY GUIDE

Sir:

We note from the September 25, 1942, issue of THE IRON AGE that your new Priorities Guide will be ready on October 8, 1942.

We would appreciate receiving a copy of the very valuable Priorities Guide and are enclosing fifty cents in stamps to cover the cost.

DONALD G. CLEMENT
Aberthaw Co., Waltham, Mass.

GAGING

Sir:

Enclosed is 15c. for which you will please send me the "Nealey" article on the Ordnance Department's improved system of Gaging.

L. M. SPEER
Intercontinent Aircraft Corp., Miami Springs, Fla.

Sir:

We read an article in your issue of September 3 which we have found very interesting and would like to have some extra copies. The article is entitled "Foolproof Gaging System" by J. B. Nealey. If it is possible for you to do so, we would appreciate your sending us four extra copies.

R. L. SNYDER, JR.
R. H. Bouligny, Inc., Charlotte, N. C.

TRIM DIES

Sir:

We would like to secure drawings or information concerning Trim Dies for Drawn Metal Parts. This type of die was featured in your magazine some time ago.

JOHN HOUGHTON,
Supt.
The Adams-Campbell Co., Ltd., Los Angeles, Cal.

• Most of the information you need is in book form. See E. G. Marshall's "Practical Die Design and Die Making", published by McGraw-Hill Book Co., 330 W. 42nd St., New York, $2; or "Press Working of Metals", by Hinman, published by McGraw-Hill, $4; or Woodworth's "Punches, Dies and Tools for Manufacturing in Presses", published by Norman Henley Publishing Co., 2 W. 45th St., New York, $5. For something new in trim dies used in aircraft plants, see page 80, The Iron Age, Oct. 1 issue.—Ed.

BLAST FURNACE LIST

Sir:

We are desirous of getting a directory or list of blast furnaces and are writing to you thinking you might either have something of this kind on hand or could tell us where we could secure a copy.

We are interested particularly in the blast furnace in the Eastern part of the country both for northern iron and southern iron.

EDWARD S. FENNESSY
The Charles Parker Co., Meriden, Conn.

• American Iron and Steel Institute's (Empire State Bldg., New York) directory sells for $10. "Directory of Companies and Officials of Blast Furnaces, Steel Plants, etc.", issued by Steel Publications, Inc., 108 Smithfield St., Pittsburgh, costs $10.—Ed.

AUTO SCRAP ANALYSES

Sir:

As producers of electric furnace alloy steel and in common with other firms in our field, we are finding scrap to be daily more of a problem. We anticipate that in the near future we will be receiving hitherto unfamiliar grades and types of scrap, particularly automobile scrap.

In order to be as well informed as possible on the subject, we are seeking whatever printed information is available and will appreciate any advice you may offer as to tabulations published by the various automobile manufacturers, technical societies, trade societies and trade magazines, which will show the analyses of automobile parts most likely to be now and subsequently on the market as scrap.

T. W. FRANK,
Asst. to Genl. Supt.
Copperweld Steel Co., Warren, Ohio

• A crying need exists for something of this kind. We investigated every possible source—the automotive industry, SAE, ASM, Institute of Scrap Iron and Steel, and government bureaus, with no success until we inquired of the American Iron and Steel Institute, Empire State Bldg., New York, which we found has prepared tables giving probable analyses of steel used in principal parts of automobile models of 1939 and earlier.—Ed.

METAL COATING ON NON-METALS

Sir:

I wish to know if THE IRON AGE has had any articles on coating with metal on non-metallic surfaces within the last year.

WARREN CHESTER
Monrovia, Cal.

• See "How To Plate Metals on Non-Metals", in issues of June 12 and 19, 1941. The demand exhausted our supply, but H. W. Wilson & Co., 960 University Ave., New York, a dealer in back issues of magazines, may be able to supply them. Otherwise the articles can be found in the 235-page cloth-bound book, "Cleaning and Finishing Metal Products", containing the best of The Iron Age information on this subject. Price is $3. Publisher is The Iron Age, 100 E. 42nd St., New York. —Ed.

SPARK TESTING

Sir:

You have published in some of your fairly recent issues some articles relating to spark testing of different grades of steel. I would be very much obliged if you would kindly advise me in what numbers I can find such articles.

HENRY DeHUFF
DeHuff & Hopkins, Philadelphia

• See the article entitled "Spark Testing", in the April 16, 1939, issue, also a two-part series under the same title in Sept. 26 and Oct. 3, 1935, issues.—Ed.

ARRESTED MALLEABLE IRON

Sir:

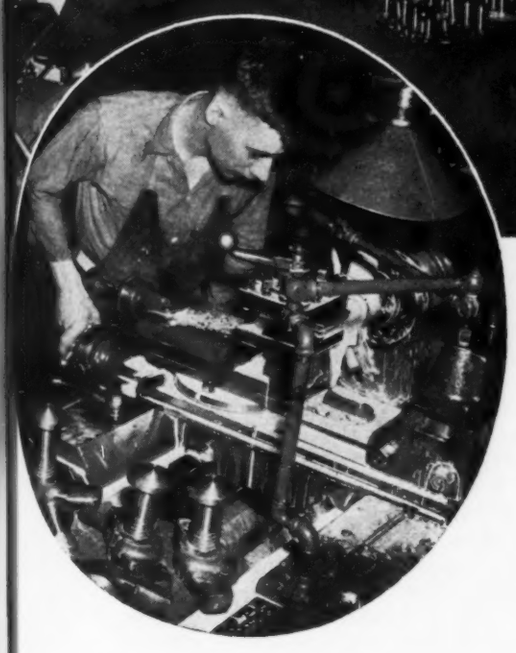
I would like to know where I might obtain all the available information to date on "arrested malleable iron", its composition, uses and complete physical properties.

If there are any books or pamphlets, what would be the source of such?

HAROLD K. WEISS
Syracuse, N. Y.

• We have published several articles on the subject during the past few years. But to get a correlated review we suggest you get in touch with the American Foundrymen's Association, 222 W. Adams St., Chicago, which recently published a book giving considerable attention to arrested malleable iron, and which also has some related technical papers on this subject.—Ed.

Precious minutes saved!



Unit saving and production increase of dogs for armored doors are multiplied by this battery of Monarch lathes.

Taking advantage of the versatility of Monarch lathes, this producer of dogs for armored doors and hatches on conning towers has reduced machining time to less than one-half the former schedule.

About half the previous time was devoted to facing and counterboring—now accomplished more than twice as fast on a Monarch lathe. Facing the dogging surface absorbed the other half of the finishing time—now done on a Monarch with an interrupted cut in 60% of the previous time. Thus Monarch does both jobs in less time than previously was required for either one.

A double advantage is thus gained. More pieces produced per hour, and machine tools released for other work.

Today, when every production minute saved is precious, and when every machine tool is so urgently needed, this example will help other plants produce faster for fighters.

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO

MONARCH LATHES

COVER THE TURNING FIELD

This Industrial Week .

- ***Action Expected Soon on Steel Budgeting***
- ***Operations Slump for Some Mills***
- ***Ingot Output Hits New Peak at 100½ Per Cent***
- ***Army-Navy Seen Winning Material Control***
- ***Metal Congress Attendance—46,538***

PROSPECTS for a drastic revision of the system of distributing steel to war plants in the U. S. were distinctly stronger at mid-week.

Steel manufacturers, favoring the Steel Budget Plan for regulating the flow of metal to consumers, appeared to have come out ahead in a brush with the automotive men who sought to side track the Budget Plan for one of their own.

The War Production Board is understood to be ready to make a flat announcement that the Budget Plan will go into effect as soon as this is practical. At least two months may be required to get the Budget Plan into shape so that actual government steel requirements can be matched against actual production capacity.

Under the Steel Budget Plan, which has been described in part in THE IRON AGE *from time to time, prime contractors will be obligated to furnish government agencies with their steel requirement data. These requirements will be analyzed and sent to the WPB Steel Requirements Committee which will match figures against capacity for a given month or quarter. After requirements are geared to production, certificates will be issued for contractors to obtain steel.*

INDUSTRY may soon face the formidable task of reclassifying its backlogs and setting up new delivery programs. Under the new Budget Plan, it is understood, there can be no such things as vast backlogs since early requirements will be matched against quarterly estimated production. (Steel men who have studied the British plan of steel distribution claim that the whole job of allocating quarterly production of British mills is done within four hours.)

As the metal-working industry waited for some definite announcement from the government on the Steel Budget Plan, which is likely to be a pattern for controls of some other vital war materials, incoming steel orders increased sharply. Reports from some companies indicate business so far in October is running 25 to 40 per cent ahead of the similar period last month. Backlogs are larger and delivery promises on many products have been considerably extended. A very large percentage of the orders carry AA ratings.

With so many limitation orders (almost 200 such orders are listed in the new Iron Age War Priorities Guide) issued against civilian product plants, many steel finishing mills are now operating at a fraction of their capacity. Examples are tin plate mills, which in some cases are running as low as 25 per cent because of lack of orders. Concrete reinforcing bar mills, now operating at a fairly high rate, will reduce production sharply as already slim backlogs disappear. (This may also be said for certain types of pipe mills.)

THE trend toward lower operations in some steel industry departments is bound to continue. While the tonnage of steel ingots being made is at a maximum consistent with the raw materials supply, equilibrium between steel ingots and finished steel products may be unavoidably unbalanced from time to time. Plants making ingots in excess of their needs will, of course, ship the steel to other mills. This has already been done in some instances. One headache of the next few months, regardless of the success of the new Steel Budget Plan, will be obtaining the proper products-mix so that the maximum amount of ingots or semi-finished steel goes to those finishing mills making the steel products most urgently needed.

Another complication in the forced decline in operations of some types of finishing mills is the threatened loss of labor. Such mills cannot hold labor on a 16-*hr. or* 24-*hr. week against the full-time pay envelopes of other sections of the steel industry or of outside war plants.*

Reports from various mill centers show that some adjustment will have to be made to increase November rollings of bars and strip if all highly rated orders are to be filled. Many structural fabricators are getting into war work; one such fabricator at Chicago is now turning out test racks for aircraft motors, gantry cranes, and scaffolding.

For some time forging facilities have been in great demand, with most forging plants loaded with orders. Now that several forgers have completed new facilities to meet this demand, they report some difficulty in obtaining sufficient work to keep the new capacity fully occupied. One reason for this open capacity is said to be an important change made recently in the scheduling of war orders.

Comparatively low operations in some steel industry departments is additional evidence of the scope of industry's conversion from peace to war footing. Many U. S. war plants have reached a point where production cannot be increased with present facilities. Other plants are likely to increase production of war goods for some months, provided that the flow of raw materials and the supply of labor (already being strained by the draft of skilled workers into the Army) are ample. A report this week by the WPB Office of War Information shows that orders held by 3021 metal industry plants on Sept. 1 were 91.2 per cent for war goods. The orders totaled $26 billion.

AT midweek it looked as if the Army and Navy had won their battle for material control. Under a reorganization of the Army and Navy Munitions Board, which has not been officially announced, indi-

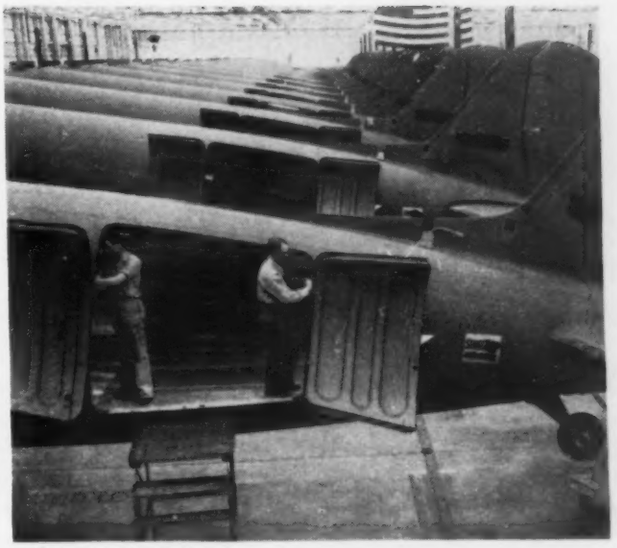
cations point to the setting up of a vertical system of material control favored by the ANMB before Ferdinand B. Eberstadt, one of its members, joined the WPB. Within every WPB branch, Army and Navy officers now represent their services. Eleven new branches within the WPB Division of Program Coordination have already been established by Mr. Eberstadt. Since these are policy branches, and since Mr. Eberstadt is in control of the operating level, complete domination of materials distribution by the armed services is now being forecast.

Changes in the WPB organization are coming with a rapidity hard for industry to follow. The eleven new branches of the WPB Program Coordination Division and their heads are:

Program integration, E. B. George; program implementation, Leonard Zick; urgency rating, Blackwell Smith; program controller, David Novick; military requirements liaison, Bertrand Fox; foreign requirements liaison, T. R. Armstrong; manpower requirements, Edwin Martin; products program, E. E. Quantrell; service program and facilities and construction program, Col. Gordon E. Textor. In Mr. Eberstadt's office, Brig. Gen. J. L. Philips has been appointed. John F. Fennelly has been appointed chairman of the Program Adjustment Committee. Newly-appointed chief of the Procurement Policy Division is Houlder Hudgins, one time assistant to W. H. Harrison, chief of the Production Division. Last Saturday, Walter E. Heller was appointed chief of the Materials Program Branch.

These changes in the WPB are making it harder than ever for an industrialist to say without checking: "I know a man at Washington." Further reorganization within the WPB seemed likely at midweek, with high WPB officials possibly involved.

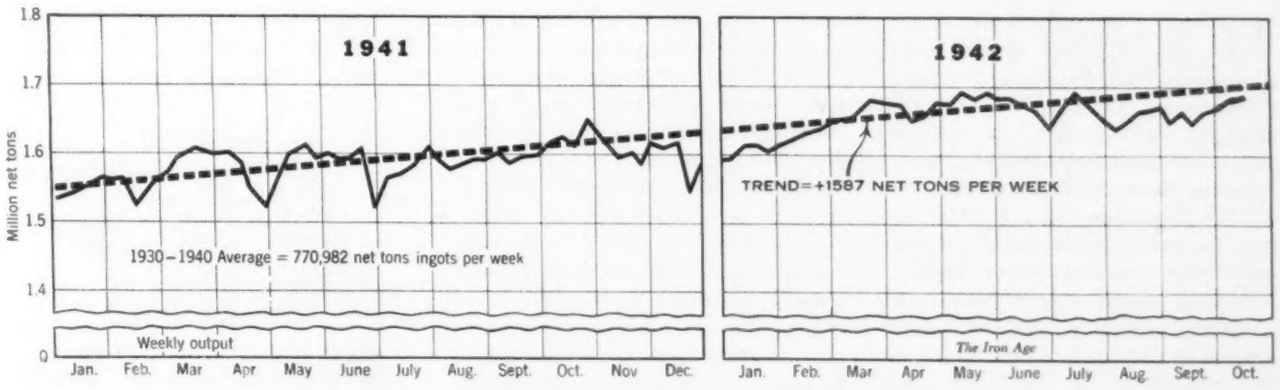
STEELMAKING for the nation this week climbed a half point to 100.5 per cent of capacity, a new all-time record in point of tonnage. Ingot-making in the Youngstown area jumped three points to 102 per cent while Detroit was up 3.5 points to 102 per cent. Cincinnati output rose four points to 109 per cent and the Eastern area's melting rate gained 8.5 points to 103 per cent. Pittsburgh production sagged a half point to 100 per cent and Chicago, Cleveland, Buffalo and St. Louis, according to information provided THE IRON AGE, reported no change in production.



FLYING FREIGHTERS: This is the Douglas C-47, a huge freight carrying plane equipped with a large freight door, reinforced floor and heavy cargo strapping rings. Powered by two 1200-hp. engines this craft will carry 5800 lb. of freight at more than 225 m.p.h. with a 3-hr. fuel reserve.

A new advance in steel production was evidence of growing scrap supplies. This week, thousands of volunteer workers were calling upon industrial plants to line up new sources of scrap, with the tonnages involved considerably greater than in home scrap salvage. Stimulation of the flow of industrial material, following the successful newspaper drive for household salvage, will send the steel industry into the Winter with a far greater backlog of scrap than seemed possible a few months ago.

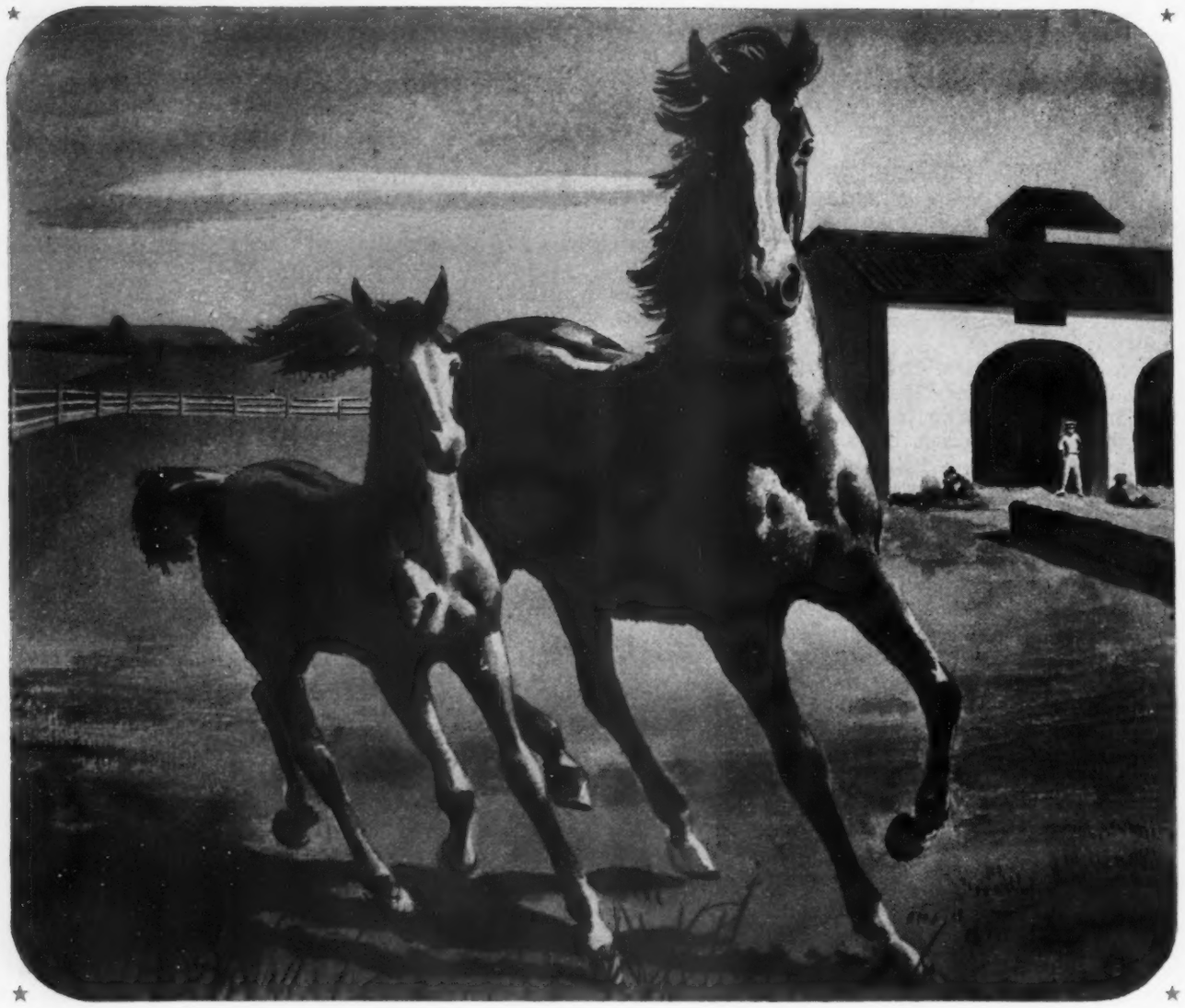
The 24th annual National Metal Congress closed Friday night in Cleveland's Public Auditorium. Total day night in Cleveland's Public Auditorium. Total attendance for the week was 46,538, highest in the history of the event, according to W. H. Eisenman, managing director of the show and national secretary of the sponsoring society, the American Society for Metals. Total registration at sessions of the four participating technical societies touched a new high mark of 23,285. Eighteen hundred persons attended one ASM war production meeting.



Steel Ingot Production by Districts Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	S.Ohio River	West	St. Louis	East	Aggregate
October 15	100.5	103.5	99.0	93.5	101.0	106.5	87.0	98.0	100.0*	105.0	102.0	111.5	95.0	100.0
October 22	100.0	103.5	102.0	93.5	101.0	108.5	87.0	99.0	103.5	109.0	102.0	111.5	103.5	100.5

* Revised



PLURAMELT...YOUNGSTER WITH A FUTURE

TODAY, Pluramelt products are entirely allocated for essential purposes. In fabricated form, they're serving in mess trays aboard ship—in field ranges—in kitchen and hospital equipment for the services—in the manufacture of synthetic rubber, high-octane gas, explosives, etc. The list includes both the single and double stainless-armored types.

In each case, of course, Pluramelt is used instead of *solid* stainless steel. The chief reason, therefore, is the very important matter of conservation. Pluramelt saves 60% to 80% of the vital chromium and nickel that solid stainless would consume for the same job.

But there are other prime considerations. Pluramelt in general fabricates easier than solid stainless steel. And, under any conditions of fabrication and subsequent service, it does not—*cannot*—come apart. Pluramelt is unique—a controlled composite steel with an *intermelted* bond that cannot be separated.

Do you want to know more about this stainless-armored steel that is so sure to bulk large in the peacetime manufacturing of the future? A new booklet, *"The Fabrication and Use of Pluramelt Stainless-Armored Steels"* is in preparation. Write us to reserve a copy for you.

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

A-8676 . . . W & D

... News of Industry ...

Wide-World Photo

AIRCRAFT BUILDERS COOPERATE: Here the knowledge and experience of all the aircraft builders are pooled in the interests of top speed war plane production. This gathering is a meeting of the Board of Aircraft War Production Council, Inc., representing all war plane builders. Left to right are: William Peters, Council Staff; Geo. C. Ford, Vultee; Jos. Sherman, Consolidated; Harry Woodhead, president of the Council and of Consolidated; Ted Sullivan, Vultee; Jack Northrup, of Northrup; Cyril Chappallet, Lockheed; Robt. Gross, Lockheed, C. T. Gross, Vega; J. Canaday, Vega; Leonard Schwartz, Lockheed; T. Claude Ryan, of Ryan; LaMotte T. Cohu, Northrup; J. H. Kindelberger, North American; Glenn L. Martin, a guest of the board; Donald Douglas, of Douglas; John C. Lee, manager of the Council and A. M. Rochlen, of Douglas.

Air Corps Seeks to Bolster Critical Materials Situation

By DON R. JAMES
Associate Editor

o o o

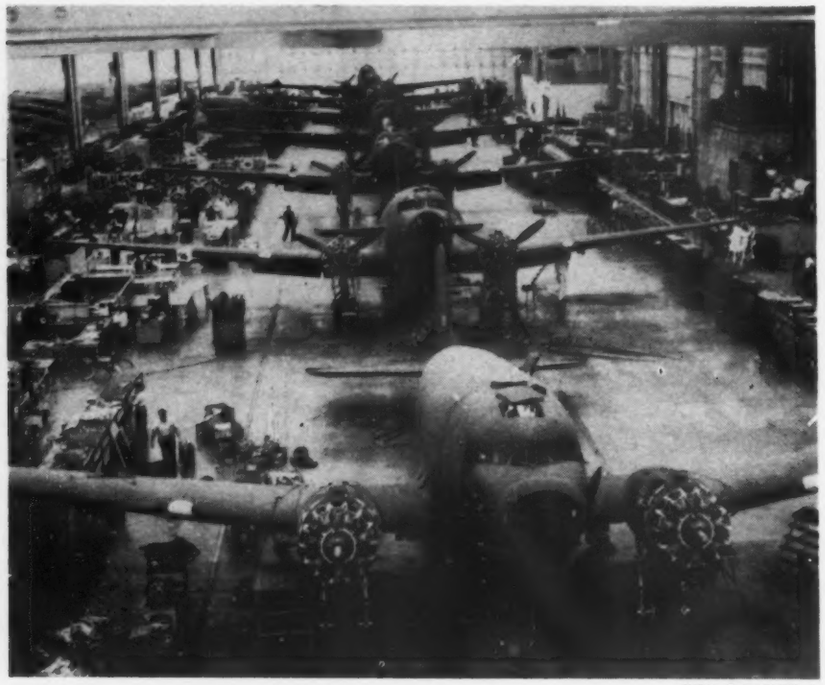
• • • **Changes aimed at** bolstering the often desperate aircraft materials situation are being made at Air Corps headquarters here. They are needed badly, in the opinion of civilian experts stationed at Dayton by the aircraft companies. These experts report that the basis is being laid for ending some of the dangerous weaknesses which exist and which all too frequently threaten to force a halt in aircraft output through lack of materials.

Shortages of steel, aluminum and copper have created one crisis after another recently, the result of faulty distribution, insufficient allotment, poor administration and countless other factors including the negligence and lack of cooperation of aircraft companies themselves. It doesn't take long for a newcomer to this city to establish the fact that the U. S. is lucky to be getting as many planes as it is, in view of all the groping around that is being done to obtain materials.

In the opinion of the outside experts who through their daily contacts are afforded an excellent picture here, a shakeup in personnel has been expected which finally will bring into the picture Air Corps officers familiar with the aircraft industry and its requirements. At the same time a determined effort is under way to bring in civilian executives who have been anxious to help but previously have felt they were not wanted. To an increasing extent aircraft producers and suppliers of raw materials will be impressed with the necessity of giving their utmost help on the materials problem and loaning the highest caliber executives they possibly can. The successful plan covering the allocation of aircraft steel tubing is likely to be extended to all aircraft steels and to other raw materials. An effort will be made to install a more comprehensive warehousing plan for emergencies and where small lots of material are desperately needed.

Reports of critical shortages of steel have been pouring into Dayton Air Force offices. About 5000 were understood to be on hand when this article was written several weeks ago, some of them indicating that unless steel was found promptly certain aircraft assembly lines would be shut down in 10 days. One aircraft company's representative said they had filed in a month's time about 450 complaints covering critical steel shortages, against about 200 on aircraft hardware and only 35 on nonferrous alloys. The situation varies between aircraft firms, of course.

One firm reported that because a Western subcontractor did not raise a rumpus after filing orders for steel in June, the assembly lines of the aircraft company would be down in 10 days. This brought a flurry of activity by Air Force officers at Dayton. For the most part small lots of steel were involved, too small to place on a mill individually. Some of the necessary material was requisitioned from a Michigan auto plant, some was found in coils at a bolt and nut plant, and in other cases it was possible to make substitutions in the analysis which the subcontractor had deemed necessary. But even these actions weren't enough to provide all the steel required to avert the shut-



Wide-World Photo

FREIGHT AND TROOP CARRIERS: The Douglas C-47's and C-53's you see rolling off the production line here are identical planes except that the C-47 is fitted with a freight door and the C-53 has wooden benches built-in for troop carrying. The C-47 will travel at a speed in excess of 225 m.p.h. with a freight load of 5800 lb. and carries a 3 hr. fuel reserve. The C-53 can cruise more than 1800 miles at over 175 m.p.h.

down. A continuous search was started on a nationwide basis.

In this case, it was quite apparent that the material was vital. In most other instances, however, Air Corps officers trying to assist a company to obtain material are in the dark as to whether the job is vital or whether the complainant is overstating the urgency of the matter. As is the case all through the war effort, facts which should be readily obtainable in order to reach a conclusion apparently do not seem to be at the finger tips of the authority who is on the spot.

While priorities control the "wholesale" distribution of materials, the Army Air Force appears to be without control over "retail" distribution. Such curbs as have been designed to prevent excess ordering or requesting deliveries before the material actually is needed, do not seem to be effective.

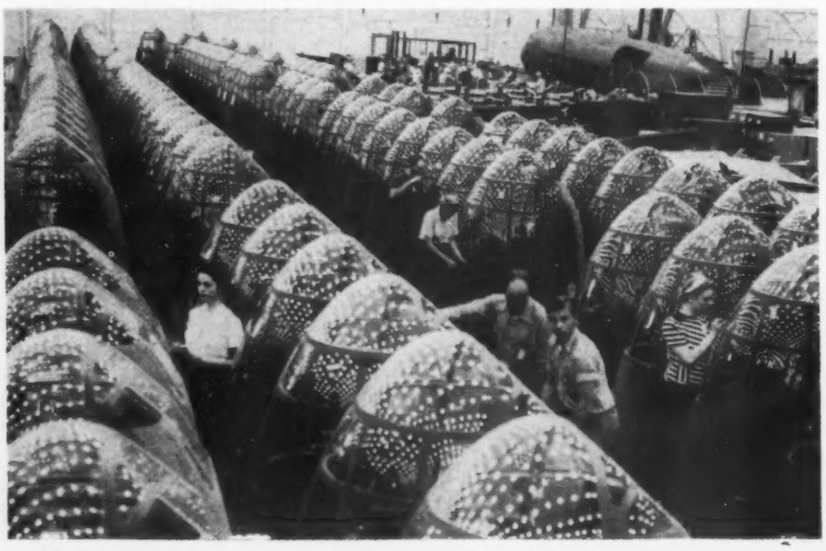
Interpretations of what constitutes a critical shortage are often at variance. It is possible that occasions might arise when training planes would be more important than bombers or fighters, or when a bank of landing gear might be sufficient to make unnecessary immediate action on a reported critical shortage.

Under the present routine, reports of critical shortages after being authenticated by a district Army or Navy man, are referred directly to the Procurement District Supervisor's office on Form ASU-16, instead of directly to the Aircraft Scheduling Unit. The complaint is then presented to district priority representatives and then to the production control district office who endeavors to relieve the situation by redistributing steel from excess inventories or surplus stocks. The procurement district office is not supposed to go to vendors or suppliers or to WPB at Washington. If unable to rectify the shortage in a week, the complaint goes to the Air Corps Industrial Planning Section at Dayton, which takes up the battle for the necessary material.

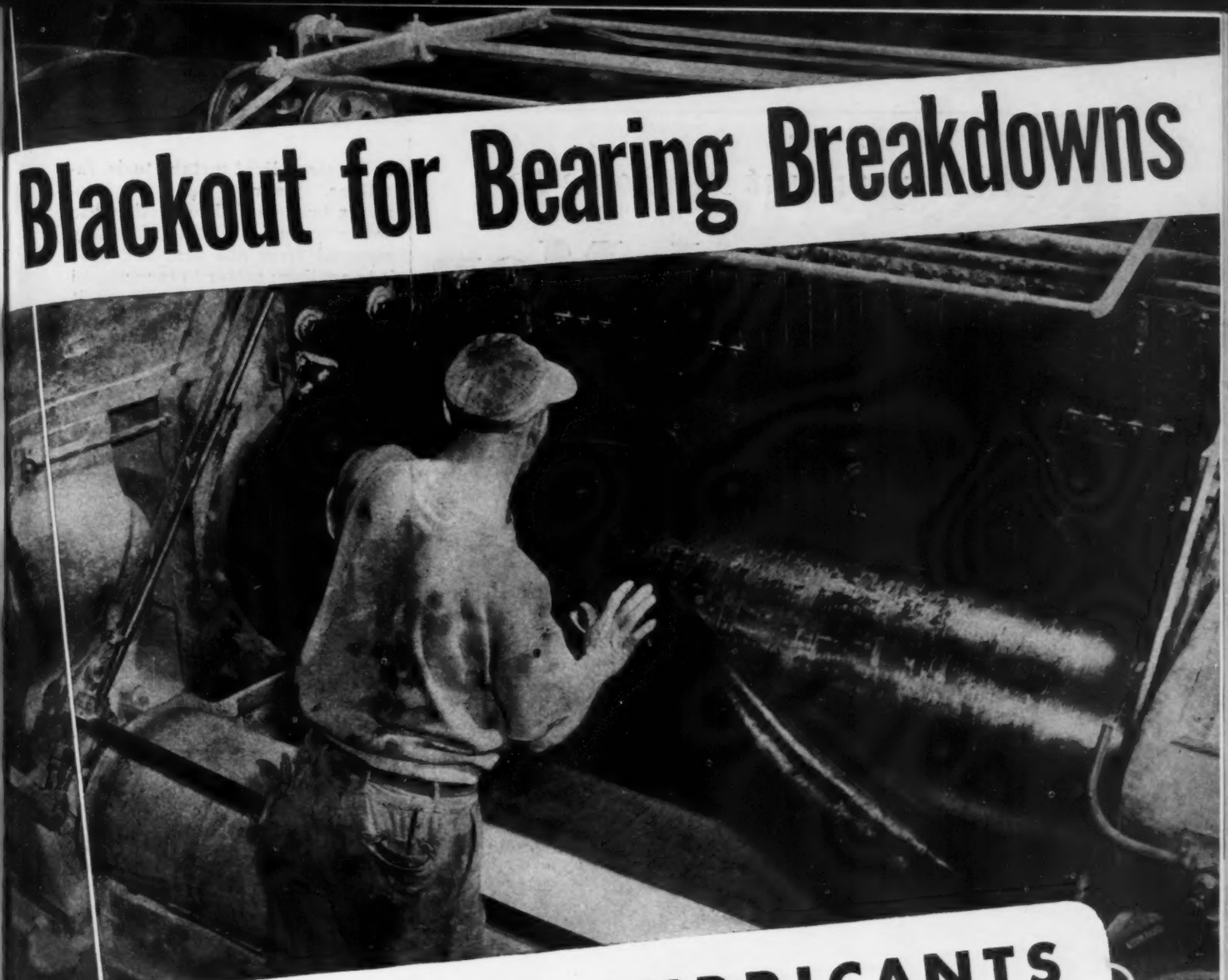
The broad picture of the setup at Dayton is that the Army Air Corps, aided by civilians under Civil Service, represents WPB through the Aircraft Scheduling Unit located at Dayton. The ASU is composed of one civilian, one Army man, one Navy representative and one British representative. It is the function of the Industrial Planning Section (the name is confusing as the section really deals with production and procurement planning) to expedite materials to the aircraft industry through such controls as may be in force by WPB at the moment. The section works with the industry through various branches such

BOMBER NOSES: These are the plastic windowed bomber noses that give our bombardiers and gunners such good vision and improved accuracy. These are for the Douglas A-20 bomber. The A-20 is powered by two 1600 hp. engines and has a speed in excess of 350 mph.

Wide-World Photo



Blackout for Bearing Breakdowns



SUN H. D. LUBRICANTS

Withstood 240° F.—250,000 lbs. pressure

Stopped Bearing Failure . . . Speeded Up Production

Bearing failures on mixers were a constant nightmare to engineers in a large rubber plant. Bronze bearings failed and ruined rolls . . . babbitt bearings wouldn't stay put . . . and production was the ultimate sufferer. Many types and grades of lubricants were tried without success.

Then the answer was found when the services of a Sun Engineer — one of those Doctors of Industry — was enlisted . . . a survey made . . . and the correct lubricant recommended. Since then there's been a "blackout" for bearing breakdowns and the "all clear" sign for production. Sun H. D. Lubricants stand up under the operating temperatures of 240° F. . . . total pressures of 250,000 pounds . . . and plant engineers say it looks as though bearings will last three or four years as compared to previous renewals of several times a year.

Whatever the problem you have involving petroleum products — lubrication or processing — call in one of those Sun Doctors of Industry. They have gained a reputation for helping industry win the battle of production and always stand ready . . . willing . . . and able to aid you in your plant. For proof of what has been accomplished in other plants write for your free copy of "Helping Industry Help America."

SUN OIL COMPANY—Philadelphia

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

SUNOCO

SUN PETROLEUM PRODUCTS.. HELPING INDUSTRY HELP AMERICA

An Important Message to

Technical Men

The war has carried the engineering age to a new peak! Production demands have created technical problems the like of which the world has never seen before! The services of engineers are at a premium. Especially the services of one particular class—executive engineers—*engineers with business training;* engineers who can "run the show."

In these critical times, the nation needs engineers of executive ability *now, today*—not five, or ten years from now! The shortage of such men is acute—even more acute than that of skilled production workers. And company heads, aware of this situation, are offering high rewards to engineers who have the necessary training in industrial management.

Golden Opportunity for Engineers

In this new era, the engineer with vision and foresight has a golden opportunity. He will realize that out of today's tremendous production battles will emerge technical men who not only will play a major role in winning the war, but who also will be firmly entrenched in key executive positions when peace comes.

However, before the engineer can take over executive responsibilities, he must acquire knowledge of the other divisions of business—of marketing, accounting and finance. He has of necessity a vast amount of technical training and experience. But in order to grasp the opportunities that present themselves today—to assume leadership on the production front—he must *also* have an understanding of practical business principles and methods.

The Alexander Hamilton Institute's intensive executive training can give you this essential business training to supplement your technical skill. It is a time-saving program that fits into the most crowded schedule. It is not intended for men who expect to remain just engineers for the rest of their lives. It is for those willing to train for the position that now seems just a little beyond them—the position which will increase their incomes today and make their security more certain when the war has ended.

13,4,000 men on the operating side of business have enrolled for this training. More than 37,500 are technical men—engineers, chemists, metallurgists—many of whom are today heads of our huge war industries.

This training appeals to engineers because it gives them access to the thinking and experience of the country's great business minds. It is especially valuable to such men because it is basic, not specialized—broad in scope, providing a thorough groundwork in the fundamentals underlying *all* business. It covers the principles that every top executive must understand. It applies to all types of industrial organizations, because all types of organizations are based on these same fundamentals.

Business and Industrial Leaders Contribute

The Institute's training plan has the endorsement of leading industrialists and business men. And it is only because these high-ranking executives recognize its value and give their cooperation that such a plan is possible. Among those who contribute to the Course are such men as Frederick W. Pickard, Vice President and Director, E. I. DuPont de Nemours & Co.; Thomas J. Watson, President, International Business Machines Corp.; James D. Mooney, President, General Motors Overseas Corp.; Clifton Slusser, Vice President, Goodyear Tire and Rubber Co. and Colby M. Chester, Chairman of the Board, General Foods Corp.

Send for "FORGING AHEAD IN BUSINESS"

The facts about the Institute's plan and what it can do for you are printed in the 64-page book, "Forging Ahead in Business". This book in its own right is well worth your reading. It might almost be called a handbook of business training. It is a book you will be glad to have in your library, and it will be sent to you without cost. Simply fill in and mail the attached coupon *today*.

SEND FOR THIS FAMOUS BOOK TODAY

Alexander Hamilton Institute, Inc.
46 West 24th Street, New York, N. Y.
In Canada, 54 Wellington St., West, Toronto, Ontario

Please mail me without cost a copy of the 64-page book—"FORGING AHEAD IN BUSINESS."

Name.....

Business Address.....

.....

Position.....

Home Address.....

as its steel, light metals, tools, facilities, planning and requirements branches. The section has power through WPB to take away material from one firm and give it to another; power to recommend removal of orders from the melt schedules and put other orders in instead; power to advise industry and to request higher priorities.

Seeking a way out of the highly confusing and dangerous steel jam, officers at Dayton are understood to be hoping to extend their tubing allocation system to other types of steel. This system, inaugurated last January after someone got the idea from a World War I report, is so simple that it sometimes baffles people who think such a job calls for all sorts of reports, red tape and formality. The system is actually worked on one small card and conducted by a seven-man force at Dayton.

Basically, the aircraft producer fills in his tubing requirements on the card and sends it in triplicate to Dayton. One of the copies of the card comes back to the aircraft firm telling it what steel company will produce the tubing, in what quantity and when. One copy goes to the steel company directing it to roll the tubing. One copy is retained at Dayton.

The system is flexible as to mill scheduling. Mills get the orders four months in advance and can roll at their convenience and in any desired sequence to suit the mill's convenience during that month.

This year under this new setup on tubing somewhere between 90,000,000 and 100,000,000 feet will be ordered and it is estimated that at the end of the year Dayton will have allocated and distributed with such accuracy that only a difference of either 15,000 ft. over actual needs or shy of actual needs will result.

The system is based on thorough knowledge of aircraft needs and absolute knowledge of the total amount of steel which the tubing unit branch can have as its share of the pie.

The method of handling the cards at Dayton by the small crew of office workers is interesting. They are sorted into groups by size ranges, such as ½-in. diameter up to and including 1½-in.; 1½-in. to 3-in., inclusive, over

3-in., etc. On sheets of paper, mill capacity is broken into ½-in. size ranges and by various grades of material. Each size range group has corresponding sheets also broken down. The data from the small cards are entered on the sheets and totaled weekly and monthly. Tonnages are sent to the mills weekly or at longer intervals if not enough of one size has accumulated to make a decent rolling for the mill.

The master sheet for each mill shows its capacity and its backlog. This is revised frequently as the backlog changes.

The tubing setup was widened to include warehouse stocks last month. The same procedure is followed, but bi-monthly reports of warehouse inventories are required.

All through the materials problems at Dayton there occurs the obstacle of promptly finding small quantities, too insignificant for mills to handle. Some officials are understood to favor a government-controlled warehouse similar to that opened in Central New York State for gun steels.

The air force probably comes closer to knowing its steel requirements than any other branch of the military forces. It consumes about 2 per cent of the nation's steel capacity, 15 per cent of alloy steel capacity and about 45 per cent of electric furnace capacity. Of the aircraft industry's requirements the ratio of open hearth to electric furnace steel is about five times as much electric as open hearth.

Improving the Dayton setup along the steps outlined above will be helpful, in the opinion of the aircraft company expediters at Dayton, but there is a limit to what can be accomplished here. A better break on materials allotments for the entire air force is needed at Washington, too, they say.

COMING EVENTS

Oct. 27 to 29—National Safety Congress Association, international convention, Chicago.

Nov. 17 to 22—National Chemical Exposition, Chicago.

Nov. 30 to Dec. 3—American Society of Mechanical Engineers, annual meeting, Hotel Astor, New York.

Nov. 30 to Dec. 4—National Exposition of Power and Mechanical Engineering, New York.

ROEBLING *Wires*

ROUND . . . FLAT . . . SHAPED

A FEW WIRES TYPICAL OF ROEBLING'S BROAD SPECIALTY PRODUCTION

Part of the job's done

WHEN YOU PUT THESE WIRES TO WORK!

FLAT WIRE TO SPECIFICATIONS

SHAPED WIRES

ROUND WIRE FOR WRAPPING OXYGEN HOSE

Want to get the jump on time and delivery schedules? Then start with Roebling wire . . . as ready as it can be made for your victory-vital products.

Take the wire used for reinforcing an airman's oxygen hose, for example. It requires close control of steel analysis, dimensions and temper for a full measure of toughness at stratosphere temperatures . . . ductility to wrap easily and tightly around the tubing. And again it's the Roebling know-how that brings this wire to the manufacturer all ready for his final fabricating operation.

With the steel-making facilities, the trained man-power and custom production tools to tackle the tasks involved, Roebling is ready to supply you with the *right* round, flat or shaped wires . . . to the most exacting standards . . . on schedule!

IRON AND STEEL ARE DESPERATELY NEEDED
Throw Your Scrap into the FIGHT!

JR ROEBLING

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY · Branches and Warehouses in Principal Cities

For the tough small jobs

FOR war work where there is much heavy duty lifting of loads weighing up to 500 and 1000 lbs., here is a hoist that enjoys the hard going.

The Load Lifter Jr. is designed with simple but completely effective construction. It has no frills nor gadgets. Therefore, there is nothing to cause trouble or interfere with its all-out, day-and-night performance. Especially where there is little headroom and a great deal of important lifting to be done, the Load Lifter Jr. is a workman's joy and a production executive's delight.

Give us enough information about the lifting job to be done, and we will tell you exactly which Load Lifter Jr. you should have. (For larger capacities, there is the Load Lifter — a big brother of the one pictured above.)

Load Lifter Jr. Hoists are available in capacities of 500 and 1000 lbs. For complete information write for catalog 347-B.

MAXWELL MANNING M&M & MOORE INC. TRADE MARK

'LOAD LIFTER JR.' *Hoists*

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load-Lifter' Hoists and other lifting specialties. Makers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Relief Valves and 'American' industrial instruments.

N.I.A.A.'s War-Winning Ideas Will Be Pooled

• • • **The National** Industrial Advertisers Association has encouraged its 2000 members and 25 chapters to take an active part in all of these war-winning efforts. Believing its best contribution as an association can be made by pooling the successful methods of its members, N.I.A.A. announces its Victory Promotions Plan, organized by its Vice-President Wilmer H. Cordes, Manager of Sales Promotion and Advertising, American Steel & Wire Co., Cleveland.

Pooling of ideas and methods of manufacturing processes has been one of the remarkable developments of war production and has contributed substantially to the success of the production program to date. There has been a marked similarity of problems throughout all war production plants, so why shouldn't one advertising man capitalize upon the proved success of another? This is exactly what the Victory Promotions Plan is intended to do.

N.I.A.A.'s activities will center around four phases of wartime

A BIG GUN PREPARES: Just ready to close the massive breech block of this 16-in. seacoast rifle is Brig. Gen. R. W. Case. The charge shown ready to be rammed into the chamber is the base charge which is used to ignite the smokeless powder charge. The smokeless charge is powerful enough to hurl the 1-ton projectile 30 miles. Photo was made just before proof-firing the rifle at Aberdeen Proving Grounds.

U. S. Army Photo by International News

promotion. Each of these four divisions is headed by a chairman, an experienced advertising man, who will correlate the work of the national association with that of local chairmen appointed in each chapter. The four divisions are: (1) War Production Promotions, (2) Industrial Training, (3) War-Winning Advertising and (4) Conservation and Scrap Salvage. Pooling and interchange of ideas will be conducted under each of these major promotion classifications.

War Production Promotions: Chairman; Morgan Fenley, Director of Publicity, Eaton Manufacturing Company, Cleveland, Ohio.

Industrial Training: Chairman; Lansing Moore, Vice-President, Holden, Stedman & Moore, Inc., Detroit, Mich.

War - Winning Advertising: Chairman; Edward H. Peplow, Jr., Manager Sales Development, John A. Roebling's Sons Co., Trenton, N. J.

Conservation and Scrap Salvage: Chairman; Walter H. Gebhart, Manager of Sales, Industrial Division, Henry Disston & Sons, Inc., Tacony, Philadelphia.

Concentrate on Substitutes For Tin in Cans, WPB Urges

Washington

• • • **The WPB Containers Branch** appealed to the can manufacturing industry last Thursday to concentrate all its research facilities on the development of usable substitutes for tinplate and blackplate in the manufacture of containers. The containers branch says that these products are becoming "increasingly scarce." Manufacturers and packers now using containers made of "critical materials" should not rely on continued supply of such containers, the branch stated.

WPB Takes Fence Away From City of Pawtucket

Washington

• • • **Some $8500 worth** of steel chain link fence erected around a baseball field at Pawtucket, R. I., must be sold to the Army and Navy according to a suspension order issued by WPB last Thursday. WPB's punishment of the city of Pawtucket was based on the fact that Order L-41-a issued on May 23 provided that all construction primarily for public amusement, costing $5,000 or more, be terminated as of June 6.

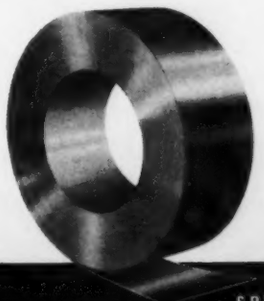
YOU CAN DEPEND ON ELECTRO-COATED

THOMASTRIP

WILL NOT CRACK OR PEEL . . . .

THOMAS cold rolled strip steel with electro-coated finishes has the proper characteristics to meet the requirements of many jobs which formerly used non-ferrous metals. These coatings will not crack or peel. Plating operations in your plant may be completely eliminated, and your parts will move directly to assembling or packaging departments uninterrupted by costly handling and delays for plating.

Send your problems to Thomas. We will make and furnish special test samples for you. Write today.



Thomas Strip

BRIGHT FINISH NOT COATED, HOT TIN COATED, ELECTRO COATED WITH NICKEL, ZINC, COPPER, BRASS . . . . .

SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

THE THOMAS STEEL CO.

WARREN, OHIO

The Press and Public Have Done a Good Job

Throughout the country the Civilian Army has responded patriotically and helpfully in the National Scrap Campaign so ably sponsored by the newspapers.

The Press has aroused the public to the need for scrap as no other medium could have done it.

As a result, hundreds of thousands of tons of hidden old metal will flow to steel mills, foundries and metal refineries.

But, the real job of supplying the steel industry with the bulk of its scrap must continue to be done by industry.

Says the American Industries Salvage Committee: "Unless the supply of scrap is tremendously increased, we will find many of our furnaces shut down for lack of material to make into steel."

The

CHARLES DREIFUS

Company

(Scrap Broker for Nearly Half a Century)

Philadelphia, Pa.
Widener Bldg.
Rittenhouse 7750

Pittsburgh, Pa.
Oliver Bldg.
Atlantic 1856

Worcester, Mass.
Park Bldg.
Worcester 6-2535

U. S. Complacency "Poison Gas", Lang Tells Gear Men

Skytop, Pa.

• • • **"The American people** insist on finding a silver lining before they have any right to and the constant danger of the complacency that comes from 'some' progress means that we can lose the war," Chester H. Lang, vice-president, General Electric Co., told members and guests of the American Gear Manufacturers Association here last week at Skytop Lodge.

Branding such complacency and lack of knowledge of what we are up against as a kind of poisonous gas, Mr. Lang added, "this kind of thinking can lick us as sure as God made little apples." Frankly touching on a subject which many people have thought about but said little, the speaker branded Army-Navy E awards as "another form of this poisonous gas."

Army-Navy E awards are, in reality, kidding us about what we are doing, Mr. Lang said, and added "these awards which many of us have mean a job well done but a job well done is really a job half done and in military language 'ob half done may lose the war."

Blasting phrase-making such as "soldiers of production," Mr. Lang warned against the thinking that production will win the war and insisted that "the soldiers will win the war and they can't win the war unless they have the material with which to fight. We must dedicate our lives to advancing the last hour of the war or else we will have something hanging over our heads which we will never be able to forget."

In making a plea to members and guests to help fully awaken those with whom they come in contact as to the seriousness of the present undertaking, he pleaded that "we carry on our work and production in such a way that later we will not have to admit to ourselves that we did not do our best or work our hardest during the time we should have."

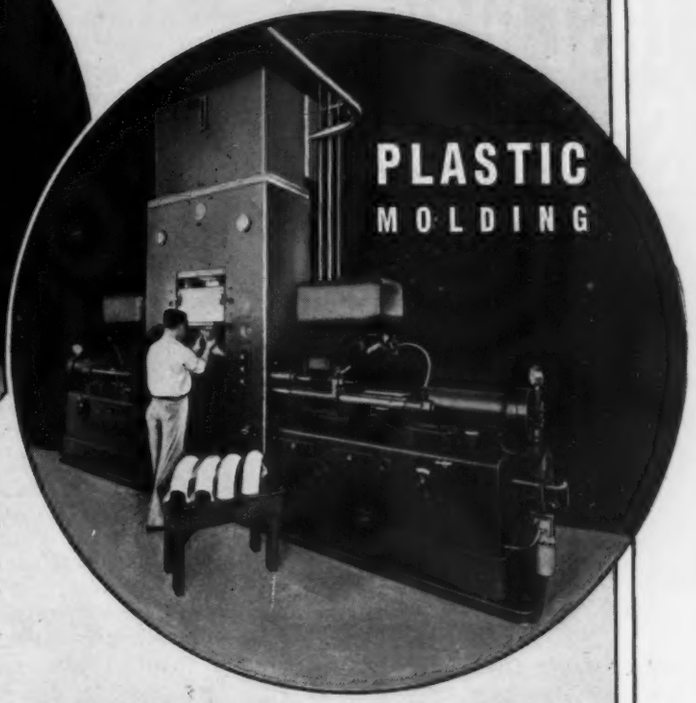
Before Mr. Lang's talk, Howard Dunbar, vice-president, Norton Co., asserted that industry can take it, has taken it, and will take it, and told gear manufacturers to help in the drive to awaken the American people as to what kind of a task they are up against in defeating the Axis.

Mr. Dunbar said that while there was considerable confusion in the beginning concerning the war effort, a definite trend in the right direction is now crystallizing. He praised the conversion of the automobile industry and especially complimented the excellent job being done by the railroads.

START OF THE BUMPER CROP: Yonkers, N. Y., started the harvest of bumpers for scrap in its "Bumpers for War" campaign with a parade and a production line where donors of steel bumpers could obtain new wooden bumpers at cost—$1.25. The car directly behind the lumber pile proudly displays one of the new wooden bumpers.

Wide-World Photo

METAL SPECIALTY



Fulfilling exacting requirements for leading industries everywhere in

PLASTIC MOLDING

•

DRAWING · COINING · STAMPING
ROLLING · FORMING · WELDING

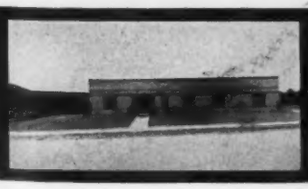
Metal Specialty's plants are equipped to render you complete service in the fabrication of all metal parts, and in plastic injection molding up through 18 ounces per shot. Along with 850-ton self-contained hydraulic presses for metal working, Metal Specialty has one of the four 18-36-ounce capacity injection presses for custom molding together with full complementary equipment.

ASSEMBLED JOBS

PRESSED METAL TO ORDER

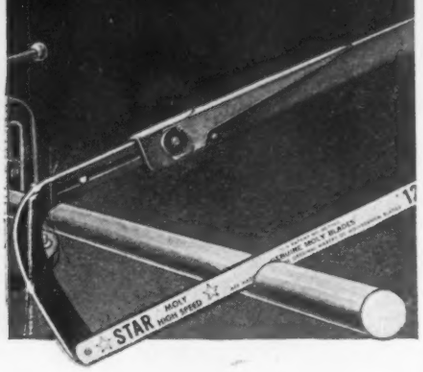
THE PLANT AT CINCINNATI, OHIO

THE PLANT AT RICHMOND, IND.



The
METAL SPECIALTY *Co.*
MAIN OFFICE AND PLANT • ESTE AVENUE • CINCINNATI, OHIO

Ten years' test makes Star best



● STAR "Moly"* High Speed – the first molybdenum alloy hack saw blade – the only genuine "Moly"*—is the result of ten years' testing by thousands of plants on heavy-duty metal sawing—the result of ten years' improvement in steel, heat treatment and uniformity.

Because of this head start, today's STAR "Moly"* High Speed is unexcelled for swift sawing and long life. For high speed sawing – hand or power – demand STAR "Moly"* High Speed. Look for its all-over copper metallic finish.

INEXPERIENCED WORKERS CAN'T BREAK

STAR Unbreakable Special Flexible in use in a frame. Yet this blade cuts and lasts like an all hard, speeding sawing and reducing blade-changing time. All-over green metallic finish.

TRADE MARK

CLEMSON BROS.

Incorporated

MIDDLETOWN, NEW YORK

**T. M. Reg.—introduced and made only by Clemson Bros., Inc. and affiliated companies.* 613

Survey Reveals Startling Facts About Manpower Problem

• • • A nationwide survey of America's steel and metal-working industry executives, reaching into and sampling all of the true industrial areas of United States, conducted by THE IRON AGE, has developed some interesting facts on what today's harried war-time executive thinks about the manpower situation and what is being done or should be done about it.

First on the list, and justly so due to current importance, was the question of a National Service Act such as has been suggested by Manpower Commissioner Mr. McNutt, Secretary of Agriculture Wickard and others. The question was not posed to determine whether we need a Service Act but to establish what such legislation should control.

From this investigation it is concluded that 62 per cent believe we should have legislation to freeze jobs, 29 per cent did not believe so, and 9 per cent had no opinion. This fairly high ratio of believers indicates that we may soon follow some form of compulsory job-freezing such as has been established in Canada and which has already been imposed on Federal employees in this country.

Proving that labor migration is a very real problem and not something being touted by job-control enthusiasts, is the fact that 78 per cent of the executives answering THE IRON AGE survey had been sufficiently affected or influenced by labor migration to state that it should be included in any labor legislation. Only 16 per cent did not want it and 6 per cent were uncommunicative.

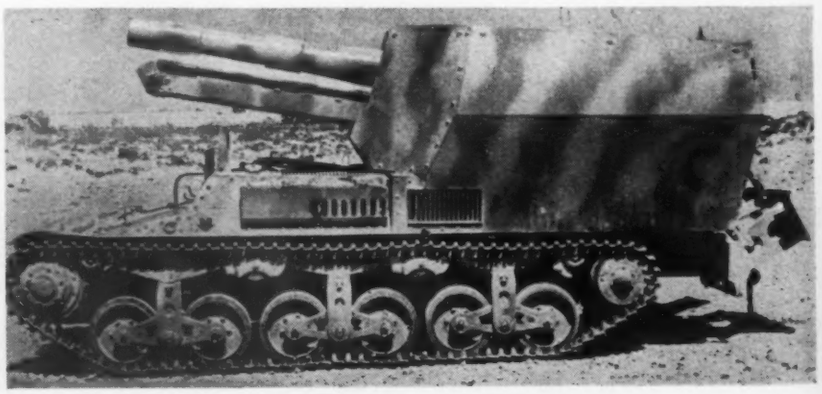
Further illustrating the mood of American industry on the subject of manpower was the reaction of 52 per cent of the surveyed executives who stated that they thought workers should be forced into war work. Thus the question of compulsory job changing is a split opinion which America is not yet ready to accept.

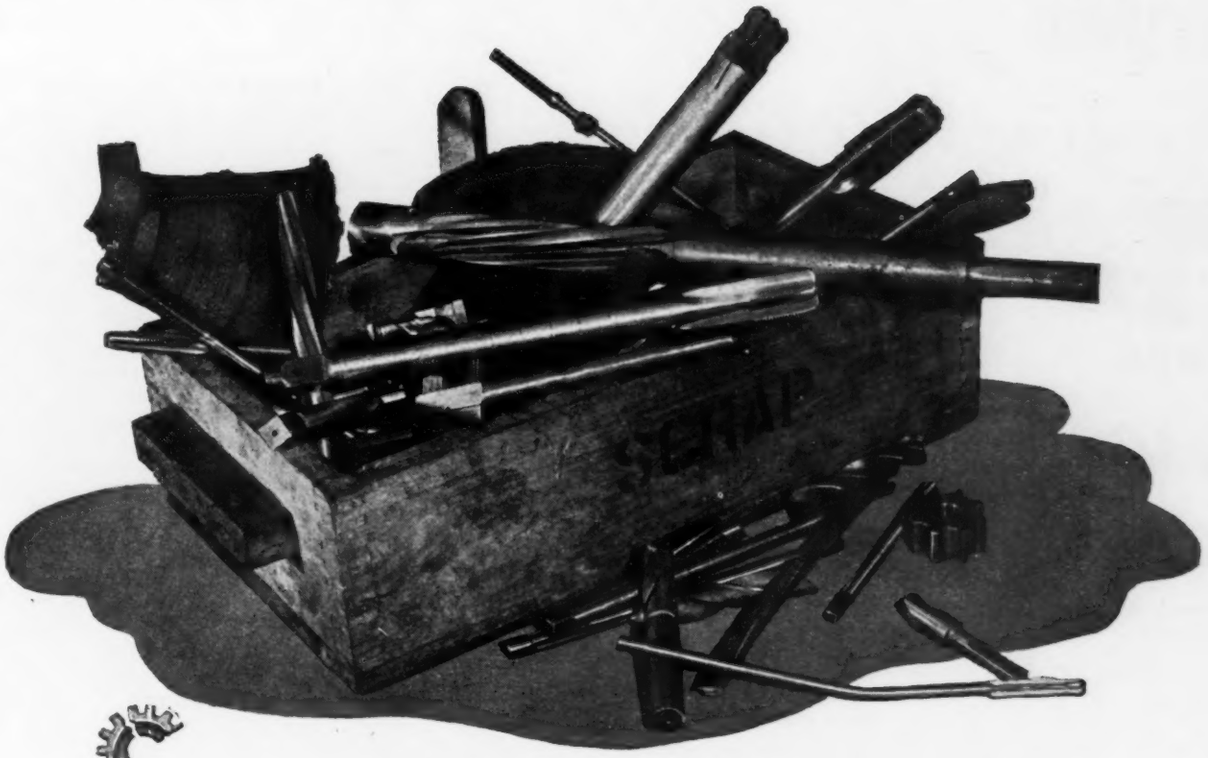
The subject of discrimination, against the negroes, which has been very prominent of late and which figured in the dealings of Henry J. Kaiser with the United States Employment Service in trying to acquire Eastern workers for his Portland, Ore., shipyards, shows up in the survey as well split with 46 per cent in favor of compulsory abolition of racial prejudice in hiring and 42 per cent dissenting.

However, it is believed that this picture leans even more heavily in favor of forceful abolition of prejudice due to the fact that some of those who did not agree possibly had no call to consider the

NAZI GALLOPING GUN: This is a 15-mm. mobile gun used by the Nazi forces in the Western Desert. Captured intact by the British, it proved on inspection to have a chassis of probable French manufacture—possibly from the Renault works recently bombed by the R.A.F. The gun was in perfect condition when captured and showed less than a thousand kilometers on its speedometer.

International News Photo





SCRAP SALVAGE
is a LAW *at* GREENFIELD . . .

SO ACUTE is America's metal shortage — particularly of high speed tool steel — that today the importance of scrap cannot be overemphasized.

Industry has a responsibility it cannot evade, not only to *reduce* scrap-making in plants, but to *salvage* it to the last ounce. Even the tungsten from filings and sludge must be recovered and turned back into productive channels.

The GREENFIELD TAP AND DIE CORPORATION has assured our Government that a rigid plan of salvaging is now in force in every department of its plants.

What "*Greenfield*" is doing, must be done by every factory and shop throughout the country. Failure to carry out a scrupulous system of salvaging can almost be viewed as actual sabotage!

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES

ARMY E NAVY

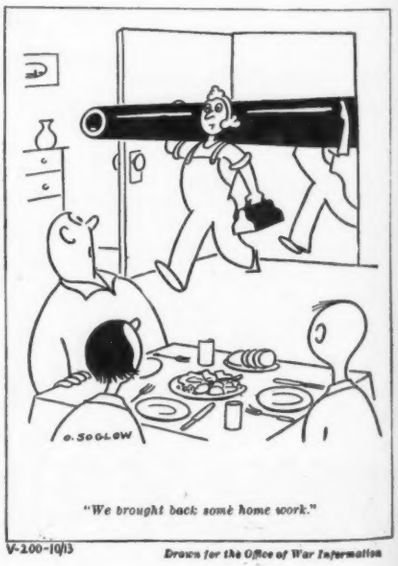
GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
DETROIT PLANT: 5850 Second Boulevard
WAREHOUSES in New York, Chicago and Los Angeles
In Canada:
GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

negro problem in their employment and were voicing only a moral and not a practical opinion.

A point in favor of such a ruling being written into labor legislation is the fact that the government's present policy is predominately one of giving the negro full rights and is a rule imposed by the United States Employment Service, as union hiring representatives for Henry J. Kaiser soon found out.

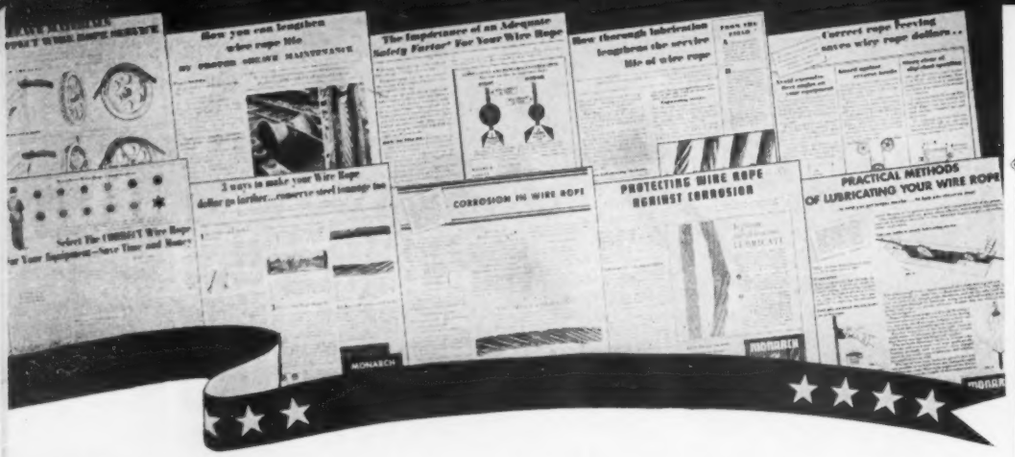
Belatedly discovered, but probably something of a headache to some Congressmen, is the fact that 98 per cent of the heavy industry executives contacted did not believe that President Roosevelt should be permitted to control the wage situation single-handed. Obviously the President is not actually doing this even under the powers of the new Economic Stabilization bill inasmuch as a board of Economic Stabilization has been set up and WLB is being relied upon heavily. The fact remains that the President is setting the policies for these agencies single-handed and in effect can run the wage control situation in close cooperation with his own opinions. Consequently, approximately 98 per cent of industry's heads are not in agreement with this method, according to the survey.

Bearing out the opinion which has, at least in a few instances, caused Selective Service leaders to threaten to reclassify war workers to 1-A military status for striking, THE IRON AGE survey shows that 98 per cent of executives believe this should be done.



"We brought back some home work."

V-200-10/13 Drawn for the Office of War Information



WIRE ROPE

Conservation Bulletins

SENT ON REQUEST

1 *Why Corrosion Shortens the Life of Wire Rope.* Tells cause, effect, and suggests remedy. Also explains how proper lubrication helps wire rope stand up against elements.

2 *How Sheave Materials Affect Wire Rope Service.* Pictures effect of hard and soft sheaves on wire rope. Explains how to avoid rope and sheave damage.

3 *How You Can Lengthen Wire Rope Life by Proper Sheave Maintenance.* Includes handy reference table on groove tolerances. Points out 3 ways to save wire rope dollars.

4 *The Importance of an Adequate Safety Factor.* What is it? How found? When is wire rope overloaded? What are minimum safety factors for various loads? All are answered in this article.

5 *How Thorough Lubrication Lengthens Service Life of Wire Rope.* Explains two lubricating methods. Shows effect (Pictures) of ropes left unprotected by lubrication.

6 *Correct Rope Reeving Saves Wire Rope Dollars.* Discusses fleet angles, reverse bends, spooling and what to do about them.

7 *Regular Inspection Saves Wire Rope Dollars.* Lists 6 common causes of wire rope failure. All can be avoided if rope user follows simple inspection procedure suggested.

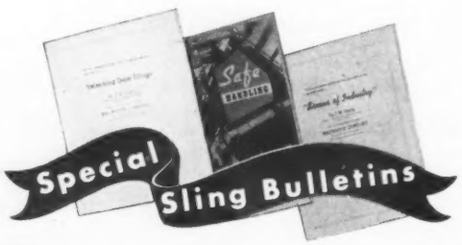
8 *Select the Correct Wire Rope for Your Equipment — Save Time and Money.* Explains how Flexibility, Abrasion Resistance, and Strength are determined to meet varying conditions of Bending Fatigue, Abrasive Wear, and Loading Stress.

9 *3 Ways to Make Your Wire Rope Dollar Go Farther — Conserve Steel Tonnage Too.* Especially valuable to men actually handling wire rope on the job.

10 *Corrosion in Wire Rope.* Gives further information on how to combat this rope destroyer. Supplements article number 1.

11 *Protecting Wire Rope Against Corrosion.* Shows some results of forgetting to protect wire rope with proper lubrication.

12 *Practical Methods of Lubricating Your Wire Rope.* Illustrates some simple ways to lubricate your wire rope on the job. Very practical, useful for everyone concerned with wire rope care.



13 *This series* of 3 bulletins tells how to get MAXIMUM service from slings. Also explains difference between various sling assemblies and most effective use for each.

MACWHYTE COMPANY Manufactures:

- MACWHYTE PREformed and Internally Lubricated Wire Rope
- MONARCH WHYTE STRAND Wire Rope
- MACWHYTE Special Traction Elevator Cable
- MACWHYTE Braided Wire Rope Slings
- MACWHYTE Aircraft Cables and Tie Rods

MACWHYTE COMPANY, 2940 Fourteenth Ave., Kenosha, Wis. • *Mill Depots:* New York • Pittsburgh Chicago • Ft. Worth • Portland • Seattle • San Francisco • *Distributors throughout the U. S. A.*

NO. 643

How to get them

Just circle those you wish and attach coupon to, or write on, your business letterhead.

MACWHYTE COMPANY, 2940 Fourteenth Ave., Kenosha, Wisconsin

I would like reprints of informative articles on how to conserve wire rope and slings which you have published recently. I have circled those I wish.

1 2 3 4 5 6 7 8 9 10 11 12 13

Name _____

Title _____

Company _____

Co. Address _____

City _____ *State* _____

International News Photo

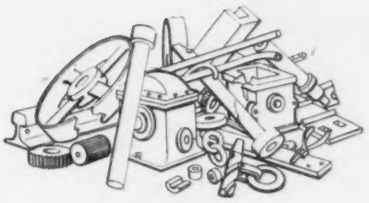
SEEING EYE BUILDS PLANES: Theodore L. Bushnell, blind, was photographed as his seeing eye dog led him faithfully through the Lockheed plant in Burbank, Cal. The Lockheed company is giving thirteen sightless persons an opportunity to try to accommodate themselves to certain aircraft plant jobs. So far they are proving themselves competent in competition with sighted persons.

Even though labor shortage is one of the biggest headaches ever encountered by industry, strikes are apparently considered to be a worse handicap—hence, this almost unanimous opinion.

It is thought by some that job-freezing, plus reclassification to 1-A in case of strikes, plus the wage stabilization which has already removed one of the major causes of strikes, would rather completely serve to settle the most irritating of the labor problems.

One interesting comment coming as a result of the survey said in part, "we have maintained for some time past that the main headache of all manufacturers was not materials but labor, and our experience over the past six months has not changed our opinion. Personally, I think it high time that the government followed the British example so that both the employers and workers would know just where they stand."

THERE MAY BE A BATTLESHIP IN YOUR PLANT



EQUALS

WE NEED YOUR SCRAP METAL

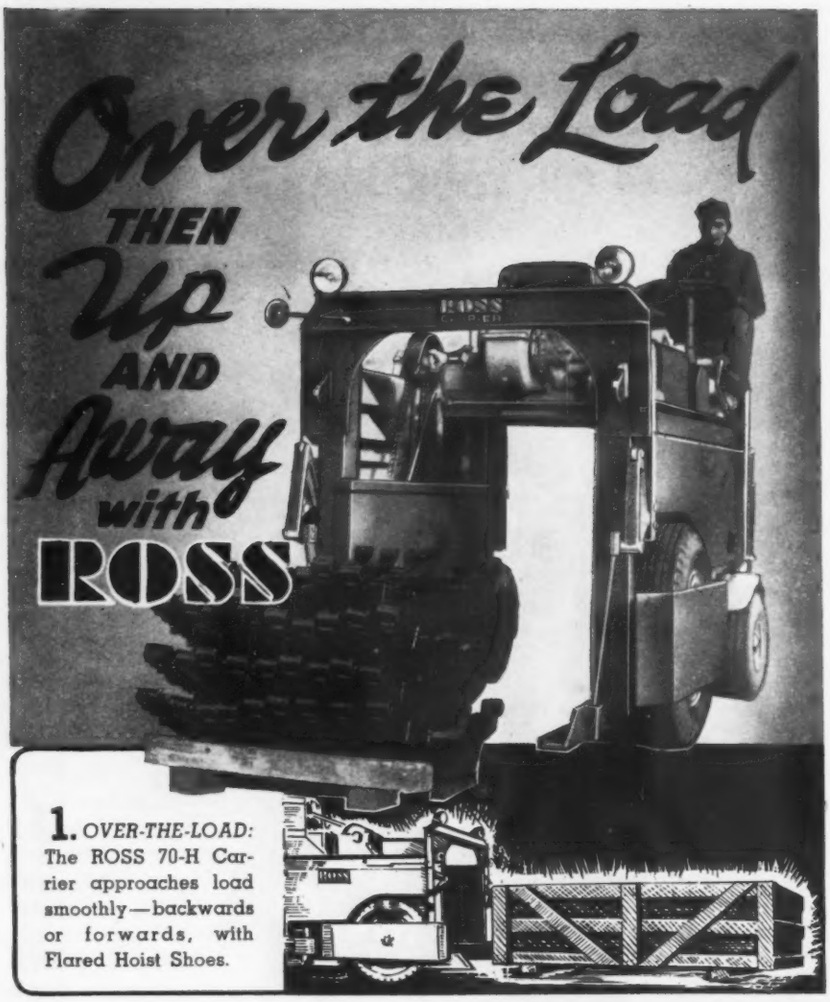
Believe it or not, there is a shortage of scrap metal in yards at the mills. The shortage is so serious that unless every pound of scrap is salvaged the steel mills may be forced to slow down.

Such a thing must not happen here.

The steel industry is faced with the necessity of digging up six million *extra* tons of scrap metal to complete the 1942 steel requirements of eighty-eight million tons. This extra scrap tonnage must come from plants, shops, garages, farms, and homes. It's up to every loyal American to cooperate.

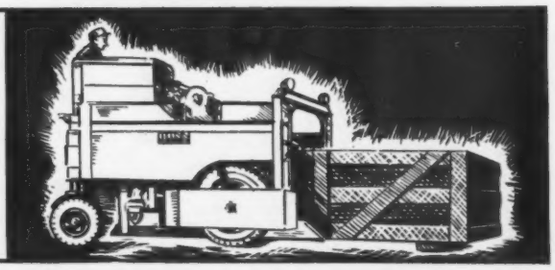
Go over your plant carefully and dig up all the scrap metal you can find. Post notices on bulletin boards telling your employes about the scrap salvaging campaign. The mills need every pound of scrap they can get, and they need it NOW! — not next year. Don't overlook any possibility — every pound counts. The urgency cannot be overemphasized.

THE ANDREWS STEEL CO.
NEWPORT, KENTUCKY
DIVISIONS
THE NEWPORT ROLLING MILL COMPANY
THE GLOBE IRON ROOFING & CORRUGATING CO.

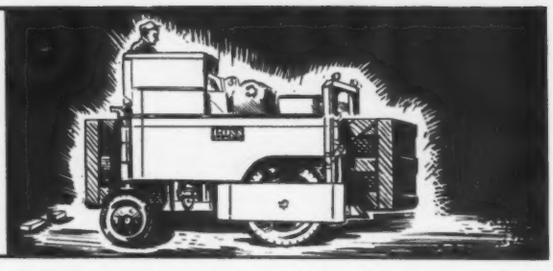


1. *OVER-THE-LOAD:* The ROSS 70-H Carrier approaches load smoothly—backwards or forwards, with Flared Hoist Shoes.

2. *THEN UP:* Lifts load fast—6" in 2 seconds. The 70-H hoists and travels simultaneously. Operator has clear view of load or ground through open-type frame.



3. AND *AWAY* — the instant load leaves ground! The 70-H slashes handling costs, brings new speed records to loading and "spotting" operations.



ROSS Series 70-H Industrial Unit-Load Carriers are fast and efficient in close quarters. Scores of plants, warehouses and docks use ROSS Carriers to speed the flow of vital materials. Bulletin I-102 contains complete data. Write for your copy today.

ROSS CARRIER CO.

***Factory:* BENTON HARBOR, MICH.**

Hoboken, N. J. **New York City** **San Francisco** **Seattle** **Portland** **Vancouver, B. C.**

Cited for Award

• • • **The following workers** in war plants have been awarded WPB certificates of individual production merit for suggestions increasing the quantity or quality of war production:

Samuel Mayer Feiner and Herbert Mattern Lowry, Bethlehem Steel Co.'s shipbuilding division, San Francisco.

Richard Bone, John M. McQuade, Joseph Boucher and Joseph S. Chuhran, marine engine division of Packard Motor Car Co., Detroit.

Jack Houghton Findlater, Packard Motor Car Co., Detroit.

Curt C. Kofahl, Fred M. Barnard, Earl A. Krakow, Louis Senick, John H. Ziegler and Norbert A. Zielke, aircraft engine division of Packard Motor Car Co., Detroit.

Carlton Jones, Martin L. Pearson and LeRoy Pyles, Yellow Truck and Coach Mfg. Co., Pontiac, Mich.

John L. Marsh and Marvin H. Crawford, Bell Aircraft Corp., Buffalo.

FIFTY YEARS: Franklin G. Smith, president of the Osborn Mfg. Co., Cleveland, and R. F. Lincoln, sales manager, review the first of a new type jolt squeeze molding machine coming off their production line. For Mr. Smith the event was of double importance, coinciding with his fiftieth year as president of the company.

Wide-World Photo

INGENUITY BUILDS A VITAL MACHINE: A big California war plant was stalled for lack of some special equipment to turn out ship fittings. Turning desperately to Sam Carter, owner of a local machine shop, for help they found a master of ingenuity who built the machines they needed from junked automobile parts. Shown, is one of the machines Carter built—a precision multiple-drill press. The gentleman at the left is the ingenious Sam Carter.

Herman Dagley and Frank E. Pressel, Jr., Inland Mfg. Division, General Motors Corp., Dayton, Ohio.

Guy Williams Lewis, Newark Stove Co., Newark, Ohio.

Vincent L. Greth and John Lobance, Westinghouse Electric & Mfg. Co., Cleveland.

Frank Curee, Bertram Hatfield and Edmund LaPrade and Paul Hegenbarth, Wright Aeronautical Corp., Cincinnati.

Herbert Rupert James, National Tube Co., McKeesport, Pa.

Ralph E. Miller, Roy H. Silvernale and Edward G. Thiele, Nordberg Mfg. Co., Milwaukee.

Joseph F. Ekstrom, Inspiration Consolidated Copper Co., Inspiration, Ariz.

Jason Harris, R.C.C. Mfg. Co., Indianapolis.

Edgar Gaston, Sebastiano Portuese, George Schelbner, Albert Strenk and Charles Trett, Jr., Cadillac Motor Car division of General Motors Corp., Detroit.

James Gilbert Heiman, Cecil A. Westmoreland, Laurence Beverly Hudson, Harry Issac Ruth and John Andrew

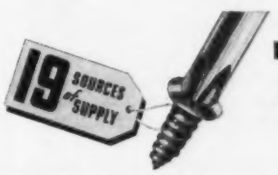
Use of Power Tools • Speedier Driving • No Slipping = 50% Less Assembly Time with Phillips Screws

Here's a way you can prove to yourself that Phillips Recessed Head Screws are "fast as greased lightning."

Check up on how many assemblies your crew handles in a day, using slotted screws. Then—give them a day's supply of Phillips Screws. Even without a change in *driving* method, production will go up. And since Phillips Screws end driver slippage, they can use power tools—with the result (on the average) that they can *double* their output.

You will *eliminate wasted effort* because the Phillips Screw clings to the driver; *prevent lost-time accidents* because screwdriver injuries are no more; and *get stronger fastenings* because Phillips Screws seat tight without heads splitting. In addition you save an average of 50% in *cost* as well as time.

Any of the firms listed below can supply you.



PHILLIPS RECESSED HEAD SCREWS GIVE YOU 2 for 1 (SPEED AT LOWER COST)

WOOD SCREWS • MACHINE SCREWS • SHEET METAL SCREWS • STOVE BOLTS • SPECIAL THREAD-CUTTING SCREWS • SCREWS WITH LOCK WASHERS

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N.H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N.Y.
Pawtucket Screw Co., Pawtucket, R.I.
Pheoll Manufacturing Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N.H.

HEAT-TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

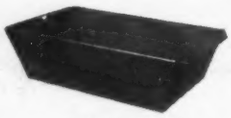
HARRISON ABRASIVE CORPORATION

Manchester, New Hampshire

HEAT-TREATED STEEL GRIT

IMMEDIATE SHIPMENT
STEEL BOXES

FOR YOUR PRODUCTION NEEDS



TAPER PANS

One-piece, all-welded construction. Hook handle at each end. Will nest perfectly when empty.

No. 101	Each
10" by 18" by 6"—18 ga.	$ .75
No. 102	Each
12" by 20" by 6"—16 ga.	$ .90

* * * *

SHOP BOXES

A straight side shop box with rigid handle and hook hole each end. Excellent for shop use where stacking feature is not required.

No. 401	Each
10" by 16" by 6"—18 ga.	$ .85
No. 402	Each
12" by 18" by 8"—16 ga.	$1.10

* * * *

STACKING BOXES

An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as a positive stacking lock and reinforce box at point of maximum wear.

No. 601	Each
10" by 16" by 6"—18 ga.	$ .95
No. 602	Each
12" by 18" by 8"—16 ga.	$1.25

* * * *

Prices F.O.B. Factory, Philadelphia, any quantity

AMERICAN METAL WORKS, INC.

1506 GERMANTOWN AVE. PHILADELPHIA, PA.

Wilson, Jr., Curtiss-Wright Corp., St. Louis.
Joseph L. Gigl, Jr., American Type Founders, Inc., Elizabeth, N. J.
Emil Forder, Research Corp., Bound Brook, N. J.
Emil Komuves, International Projector Corp., New York.
Carl C. Fleming, William L. Hill and Fred R. Will, Jr., Goodyear Tire & Rubber Co., Akron, Ohio.
Thomas Born and John Glowe, White Motor Co., Cleveland.

The following plants have also received producton awards:

Army-Navy "E"

Budd Wheel Co., Philadelphia.
Farrel-Birmingham Co., Ansonia, Conn.
General Electric Co.'s Radio, Television and Electronics department, Schnectady.
International Nickel Co., Inc., Huntington, W. Va.
Auto Ordnance Corp., Bridgeport, Conn.
Auto Specialties Mfg. Co., St. Joseph, Mich.
Barbour Stockwell Co., Cambridge, Mass.
Beech Aircraft Corp., Wichita, Kan.
Bendix Aviation Corp., Eclipse-Pioneer Division, Bendix, N. J., and Philadelphia Division, Philadelphia.
Boonton Molding Co., Boonton, N. J.
Bucyrus Erie Co., South Milwaukee.
James Cunningham Son and Co., Rochester.
E. I. du Pont de Nemours and Co., Electro Chemicals Department Plant and Niagara Falls Plant, Niagara Falls.
General Motors Corp., Allison division, Indianapolis.
B. F. Goodrich Co., Akron Plant, Akron.
Gundlach Mfg. Co., Fairport, N. Y.
P. H. Hanes Knitting Co., Winston-Salem, N. C.
Hobart Mfg. Co., Troy, Ohio.
Hood Rubber Co. division of B. F. Goodrich Co., Watertown, Mass.
A. R. Hyde and Sons Co., Cambridge, Mass.
Indium Corp. of America, Utica, N. Y.
Industrial Tool and Die Works, Inc., St. Paul.
Johnson & Johnson Gas Mask division, Chicago.
Johnson Steel and Wire Co., Worcester, Mass.
Leece-Neville Co., Cleveland.
Lights, Inc., Alhambra, Cal.
Lipe-Rollway Corp., Syracuse, N. Y.
Mack Mfg. Co., New Brunswick, N. J.
Monitor Piezo Products Co., South Pasadena, Cal.
Parish Pressed Steel Co., Reading, Pa.
Philco Corp., Chicago.
Rieke Metal Products Corp., Auburn, Ind.
Texas Gulf Sulphur Co., Galveston Loading Plant, Galveston, Texas, and Newgulf Plant, Newgulf, Texas.
Berg Boat Company, Georgetown, Md.
Bethlehem Steel Company, Sparrows Point, Md.
Brann & Stuart, Inc., Mechanicsburg, Pa.
Chapman Valve Manufacturing Co., Indian Orchard, Mass.
Contractors, Pacific Air Bases, Pearl Harbor, T. H.
Doyle and Russell, Norfolk, Va.
Edo Aircraft Corporation, College Point, Long Island, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Kingsbury Machine Works, Inc., Philadelphia, Pa.

Kollmorgen Optical Corp., Brooklyn, N. Y.
Macco Construction Company, San Diego, Cal.
Manufacturers Machine & Tool Co., Inc., New York, N. Y.
Marquette Metal Products Company, Cleveland, Ohio.
Maxon Construction Company, Burns City, Ind.
Owens-Corning Fiberglas Corporation, Ashton, R. I.
Owens-Corning Fiberglas Corporation, Newark, Ohio.
Powers and Company, Philadelphia, Pa.
Radiomarine Corporation of America, New York, N. Y.
W. A. Robinson, Inc., Ipswich, Mass.
Scott Aviation Corporation, Lancaster, N. Y.
Simpson Optical Manufacturing Co., Chicago, Ill.
Sylvania Electric Products, Inc., Emporium, Pa.
Union Asbestos and Rubber Company, Paterson, N. J.
Wyman-Gordon Company, Harvey, Ill.
Wyman-Gordon Company, Worcester, Mass.
York Safe & Lock Company, York, Pa.
Youngstown Welding and Engineering Company, Youngstown, Ohio.
National Supply Co., Ambridge plant, Ambridge, Pa.
Joshua Hendy Iron Works, Sunnyvale, Cal.
Revere Copper & Brass, Inc., Dallas Division, Chicago, Ill.
Aluminum Industries, Inc., Cincinnati.
American Tool Works Co., Cincinnati.
Chain Belt Co., Milwaukee.
Fosdick Machine Tool Co., Cincinnati.
National Automatic Tool Co., Inc., Richmond, Ind.
National Broach & Machine Co., Detroit.
New Britain-Gridley Machine Division, New Britain Machine Co., New Britain, Conn.
Leeds & Northrup Co., Philadelphia.

Treasury Dept. "T"

Manhattan Rubber Mfg. Co., Passaic, N. J.
Wellman Engineering Co., Cleveland.
Sundstrand Machine Tool Co., Rockford, Ill.
Veedor-Root, Inc., Hartford.
Westinghouse Electric & Mfg. Co.'s Transformer Division, at Sharon, Pa.; and East Pittsburgh Division at Derry, Pa., East Pittsburgh, Pittsburgh, and Trafford, Pa.
American Hoist & Derrick Co., St. Paul.

M Awards

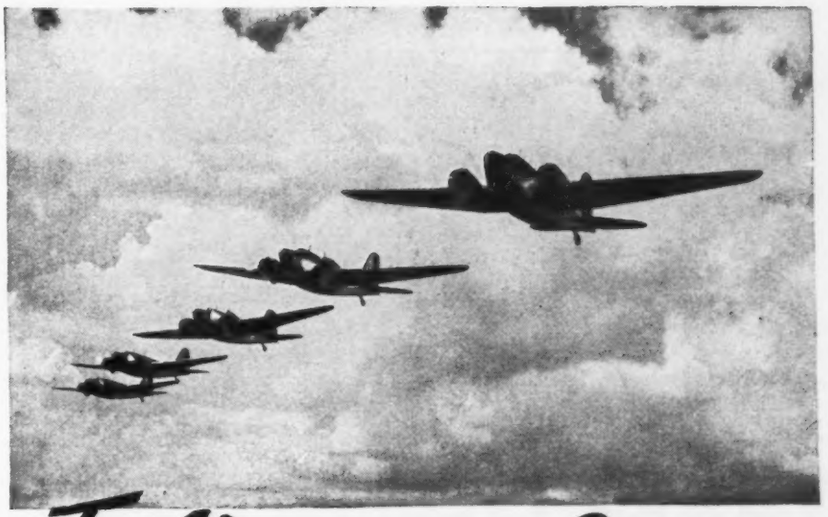
Wilson-Snyder Mfg. Division of Oil Well Supply Co., Braddock, Pa.

Minute Man Flag

Binks Mfg. Co., Chicago.

Timken Honors Subcontractors

• • • **Timken-Detroit** Axle Co., Detroit, has awarded "certificates of appreciation" to 100 of the company's subcontractors, for meritorious performance on contracts for war material.



"The Yanks are Coming"—
---MORE AND FASTER!

THE job of converting American industry moves swiftly. Yank fighting equipment is moving to every Allied battle front — much more and much faster! To make sure of that, industry is using P&H Zip-Lifts — the time-and-labor-saving hoists that speed the lifting and moving of materials from raw state to finished products—at the mere push of a button. In shops, assembly lines, loading zones and warehouses—they are saving time and energy—making manpower go farther.

P&H ZIP-LIFT
HARNISCHFEGER CORP. MILWAUKEE, WIS.

CAPACITIES:
250, 500, 1,000, 2,000 POUNDS

Full magnetic push-button control — preformed non-spinning hoist cables — 3-way interchangeable mountings — and safety limit switch are just a few of the *important* features that make P&H Zip-Lifts the top value among low priced electric hoists.

HONEST DELIVERY DATES

Our biggest job is to make enough Zip-Lifts to go around. While direct war production needs must be served first, you can always depend on P&H's delivery promises.

Awarded the Navy "E" for excellence in war production, P&H displays it also as a pledge of future effort.

General Offices: 4401 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

Electrolytic Tin Plate Production Under Way At C-I Irvin Works

Pittsburgh

• • • **Following a delay** in original estimates of from two to three months, Carnegie-Illinois Steel Corp. is now operating the first of two new electrolytic tin plate lines at its Irvin works. The unit, which is larger than the company's original one at Gary, Ind., is now producing commercial electrolytic tin plate and has a capacity in excess of 1,000,000 base boxes a year.

Similar lines are being installed at U. S. Steel Corp.'s subsidiaries at Chicago and Birmingham and it is believed that these units also will be from two to four months late in getting into production.

From an overall standpoint, the entire electrolytic and bonderizing program announced several months ago is from three to six months behind initial installation schedules. Main bottleneck has been the unavailability of electrical equipment. Difficulty in obtaining electrical equipment is said to have been due to the tight situation in strategic materials going into the manufacture of electrical equipment, as well as higher priority orders from other war sources.

In view of the strategic and tight position of pig tin in the country, the serious aspect of the delay in getting electrolytic lines in operation is that more pig tin is being used up than would be utilized if many of the lines were now in operation. Hot dipped plate, which to a great extent will be replaced by electrolytic tin plate, uses 1.25 per cent tin per base box, while electrolytic tin plate on the average will utilize 0.5 per cent tin per base box. The longer it takes to bring these lines into production, the more the available tin supply will be reduced.

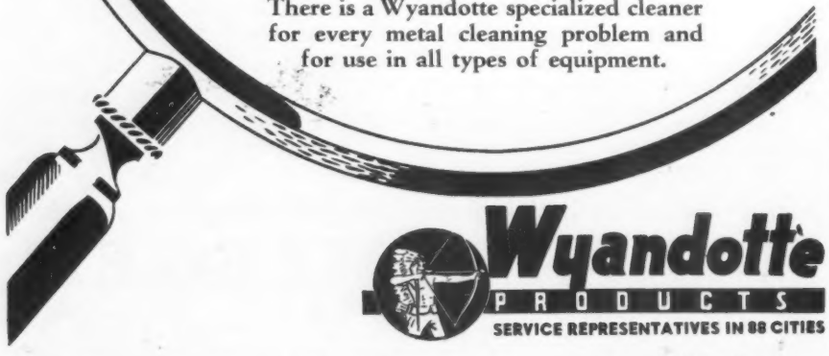
Electrolytic tin plate is being commercially sold at a base price of $4.50 a base box, f.o.b. Gary and Pittsburgh, unassorted. This price has already been filed with the OPA by one of the U. S. Steel subsidiaries and is expected to be the basic price charged when other units are brought into production.

INVESTIGATE

OUR SPECIAL DEGREASING COMPOUNDS AND CLEANERS

1. For cleaning brass and steel cartridge cases, all sizes, after drawing and machining.
2. For cleaning H. E. and A. P. projectiles all sizes, after machining, and prior to lacquering and painting.
3. For process cleaning of airplane motor parts (aluminum and magnesium).
4. For cleaning sheet aluminum prior to spot welding and for cleaning sheet and cast aluminum prior to anodizing.
5. For cleaning fuses and fuse bodies (aluminum or brass) after machining.
6. For cleaning steel fuse parts and boosters prior to cadmium plating.
7. For cleaning bomb fins, fin assemblies, and similar steel stampings prior to painting and lacquering.
8. For cleaning prior to cadmium and hard chrome.
9. For cleaning prior to all blackening and blueing operations and after magnaflux.
10. For cleaning prior to Bonderizing and Parco-Lubrizing operations.
11. For use in water-wash spray booths.
12. For burnishing and stripping.

There is a Wyandotte specialized cleaner for every metal cleaning problem and for use in all types of equipment.



Wyandotte PRODUCTS

SERVICE REPRESENTATIVES IN 88 CITIES

THE J. B. FORD SALES COMPANY • WYANDOTTE, MICHIGAN

National Supply Co. Mill Ruined in $500,000 Fire

Pittsburgh

• • • **Early last week** the conduit pipe mill of the National Supply Co., Spang Chalfant division, was destroyed by fire with damage estimated at $500,000. The plant, which was working on war orders, was completely wrecked as molten enamel, shot from a baking oven by a dull explosion, ignited the huge building.

J. & L. Mill Sets Mark

Pittsburgh

• • • **Another record** for war steel production on a strip-sheet mill was established in the Pittsburgh works of Jones & Laughlin Steel Corp. recently when the crews of the one-half inch shear line processed 4651 net tons of steel plates in 24 hours. This is 149 net tons more than the previous world's record.

SIR CHARLES INSPECTS: Chairman of the British Aircraft Constructors, Sir Charles Bruce-Gardner (right) inspects the precision workmanship of the new American-built Rolls-Royce engine as the guest of Geo. T. Christopher, president and general manager of Packard Motor Car Co. Sir Charles is one of a mission sponsored by the British Ministery of Aircraft Production.

"Steel for Victory" Film Starts Showing in Pittsburgh

Pittsburgh

• • • **Movie-goers** in Pittsburgh are seeing at firsthand the way in which the scrap they donate is made into war materials. "Steel for Victory," the new film produced by United States Steel Corp. subsidiaries, started at the Fulton Theater last Saturday, Oct. 17.

The film portrays the role performed by United States Steel in the production of material for the armed forces of the United Nations. Included are scenes of the manufacturing processes employed in making steel, armor plate, tank armor, shell forgings, bomb casings and naval vessels.

Westinghouse Doubles Ship Motor and Turbine Output

• • • **Production of propulsion** equipment for naval vessels and turbines for land powerhouses, at the Westinghouse Steam Division, South Philadelphia, has amounted to $50,356,000, more than double the $23,998,000 production before the ten months preceding Pearl Harbor.

Aircraft Expansion Among Newly Approved Contracts

• • • **The Defense Plant Corp.,** RFC subsidiary, has authorized the following contracts:

Northrop Aircraft, Inc., Hawthorne, Calif., to provide for the construction and equipment of a plant in California at a cost in excess of $2,500,000.

Dow Chemical Co., Midland, Mich., for machinery and equipment for a plant in Michigan at a cost in excess of $1,500,000.

United States Industrial Chemicals, Inc., New York, to provide plant facilities in Maryland at a cost in excess of $1,000,000.

Oil Gear Co., Milwaukee, Wis., to provide plant facilities in Wisconsin, at a cost in excess of $1,000,000.

Solar Mfg. Corp., Bayonne, N. J., for plant facilities in Illinois at a cost in excess of $500,000.

Fairchild Aviation Corp., Jamaica, N. Y., to provide equipment in New York at a cost in excess of $350,000.

Oberdorfer Foundries, Inc., Syracuse, N. Y., to provide equipment and machinery in New York, at a cost in excess of $300,000.

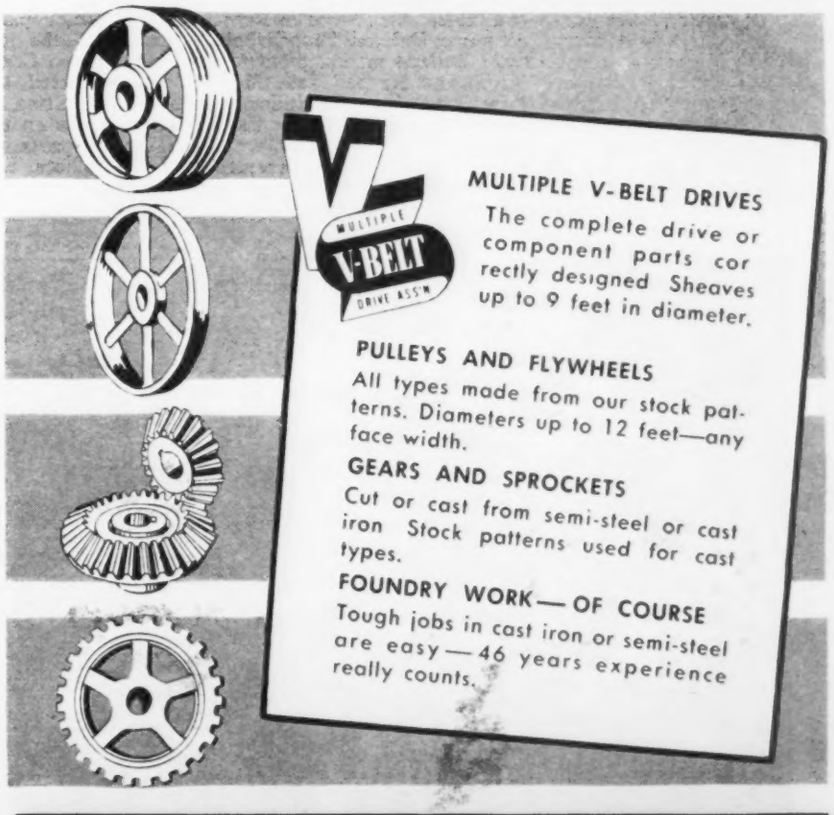
General Distillers Corp. of Kentucky, Louisville, Ky., for equipment to be placed in a plant in Kentucky at a cost in excess of $15,000.

Belle Meade Products Co., New York, to provide equipment to be placed in a plant in Virginia at a cost in excess of $10,000.

A. Smith Bowman, Sunset Hills, Va., for equipment to be placed in a plant in Virginia at a cost in excess of $7500.

PYOTT

A NAME TO CHECK FOR POWER TRANSMISSION


MULTIPLE V-BELT DRIVES
The complete drive or component parts correctly designed Sheaves up to 9 feet in diameter.
PULLEYS AND FLYWHEELS
All types made from our stock patterns. Diameters up to 12 feet—any face width.
GEARS AND SPROCKETS
Cut or cast from semi-steel or cast iron Stock patterns used for cast types.
FOUNDRY WORK— OF COURSE
Tough jobs in cast iron or semi-steel are easy — 46 years experience really counts.

PYOTT FOUNDRY AND MACHINE CO.
328 NORTH SANGAMON STREET • CHICAGO

Women Fill Many Jobs in U. S. Industry

Harrisburg, Pa.

• • • **The drain of manpower** into the armed forces has brought an urgent need for industrial labor, and American women by the millions have gone into war industry, according to the director for Pennsylvania of the U. S. Employment Service.

The range of jobs being filled by women workers is said to be amazing in its variety and includes lens grinders, crane operators, airplane mechanics, ordnance inspectors, welders, riveters, truck drivers, parachute riggers, etc.

For additional news on women in industry, especially steel and other metal working fields, see The Iron Age, Sept. 24, p. 85.

More impressive than the variety of jobs being filled, many of them for the first time in history by women workers, are the overall figures on the number of women already enlisted in the war production army and those expected to enroll in the near future, says the U. S. Employment Service, which conducted a roundup of information for THE IRON AGE.

Estimates place the present total of women workers at more than 3,000,000, and the figure is expected to reach 4,500,000 by the end of 1942 and surpass the 6,000,000 mark by the end of 1943. By that time, it is said, approximately 5,000,000 women not now employed must be added to the labor market to meet the anticipated demands of war industries and civilian occupations. At that time also it is estimated that one out of every six women between the ages of 18 and 44 will be employed in the war effort.

The number of women employed in these war plants in September, is said to be 75,155 representing approximately 10 per cent of the total labor force in these firms. This proportion is particularly significant because these firms are chiefly heavy industry, a category in which the employment of women prior to the war was almost negligible.

According to the United States Employment Service, many industrialists viewed with considerable pessimism the prospect of being forced to utilize women workers in their operations. However, all the scientific studies which indicated the feasibility of placing women on war jobs have been steadily bolstered by the experience of the plants throughout the nation which are successfully using women in many departments.

Careful tests, it is said, indicated that while women averaged only one-half of the average man's lifting strength and about two-thirds of the average man's pulling strength, they tend to excel in manual dexterity and muscular coordination.

A survey of more than 1800 specific occupations in key war industries by the U. S. Employment Service disclosed that women could perform about 80 per cent of war industry jobs. Of 624 key occupations in war industries covered in another study, it was found that there were only 57 which women could not handle as capably as men.

The experience of the U. S. Employment Service, through its 4500 offices throughout the country, and which is in direct and continuous contact with labor supply problems, reflects the steadily increasing momentum of the trend towards wider employment of women workers. More and more U. S. offices, it is said, report expansion of the three activities which move women into the ranks of the production army, namely, intensive recruitment of women for war work, increased referrals of women to government sponsored war production vocational training courses, and finally, more and more placement of women in war jobs.

BULLARD THUNDERBOLT: Employees of the Bullard Co., Bridgeport, Conn., have given the Army Air Force a Republic P-47 fighter plane which will carry the name Bullard Thunderbolt. Sponsors of the gift campaign, in which the Bullard management took no part, were Crane Operator Esther Norell and Nurse Elsie McKee, who collected the $75,000 to buy the plane. Five thousand Bullard employees who attended the plane presentation ceremony will follow the plane's progress on the battle fronts through telegrams to be sent from the War Department describing the Bullard Thunderbolt's achievements. In this photo, left to right facing the camera, are: E. P. Bullard, president of the Bullard Co.; Mayor Jasper McLevy of Bridgeport, and Maj. Gen. James E. Chaney, of the Army Air Force.

Brainard Plans to Quit WPB

Washington

• • • **George C. Brainard** has asked that he be relieved of his duties as head of the WPB Tools Division in order that he may return to his position as president of the General Fireproofing Co., Youngstown, Ohio. It was announced that Mr. Brainard will remain as head of the Tools Division until his successor is chosen.

Army Saves 44 Per Cent of Metals in New Style Camps

Washington

• • • **A saving of** approximately 26,000 tons of metals, for each 100,000-man unit, is being made by the Army Corps of Engineers in the construction of camp facilities. Last year, it required approximately 59,400 tons of metals to install facilities for every 100,000 soldiers. This includes all the steel, copper, tin, iron, lead and zinc which went into buildings and sewage, water, electrical and transportation systems, including railroad tracks. Today, the Corps of Engineers is using approximately 33,400 tons of these metals for every 100,000 men.

A year ago, the Corp of Engineers was putting up semi-permanent buildings. Today the buildings are temporary. Concrete and wood are replacing cast iron sewage pipe. Sanitary fills are being used instead of sewage disposal plants.

For every 100,000 men in the former type of cantonments, it required 27,700 tons of iron. The new type requires 17,000 tons, 39 per cent less. Steel requirements formerly were 29,000 tons. Today 15,400 tons are being used, 47 per cent less. Copper requirements were 1100 tons. Present requirements are 440 tons, 59 per cent less. Formerly, 35 tons of tin were required; today's requirement is 12 tons, 66 per cent less. The former lead requirement of 1030 tons has been reduced to 460 tons, 56 per cent less. Zinc requirements were 550 tons, and are now 228 tons, 59 per cent less.

Hudson To Build Invader Engines

Detroit

• • • **Hudson Motor Car Co.** is preparing to produce marine engines for installation in landing and invasion boats. The "Invader" engine will be built almost entirely with automobile machinery which company engineers have converted for the project. This manufacturing is the third new war production contract Hudson has announced recently, and has been preceded by schedules for medium bomber fuselage sections, dive bomber wings, airplane engine parts, tank parts, and Navy mine anchors.

Hopwood Quits As President of WMI

Pittsburgh

• • • **John M. Hopwood,** president of Hagan Corp., and for the last six weeks president of War Materials, Inc., resigned his WMI leadership Oct. 15, in apparent disappointment over the results of the recent RFC-WPB decision reducing WMI to a mere buying agency for the salvage section of WPB.

First intimation that all was not well with WMI came last week. Field offices of the agency were closed quietly without notice.

Leaving the rolls of WMI with Mr. Hopwood were J. L. Logan and H. A. Bergquist, both of whom had been drafted from the Hagan Corp. Joseph E. Jacobson, who quit as Pittsburgh director of Luria Bros. & Co. to assist Mr. Hopwood, also is expected to resign. Mr. Hopwood could not be reached for further comment.

MARGIN *of Victory!*

AN AMERICAN FACTOR which normally provides a margin of profit, now also may provide *a margin of victory!* Putting *FLOW* into production, via soundly engineered conveyors, is purely American. It will help win this war! For that handling problem *write* LOGAN, 545 Cabel, Louisville, Ky.

Logan Conveyors

PUT *FLOW* INTO PRODUCTION

U. S. Fighter Planes Seen as Most Versatile

• • • **More than** 2000 of one type of U. S. fighter plane, among seven different types each designed and built for a specific purpose, have been sent to war fronts in the last 12 months, according to a recent statement by the Aeronautical Chamber of Commerce of America, which pointed out that the American fighter force is the most versatile in the world.

"Ours are the only air forces as yet to develop so many different types of successful fighter aircraft, especially designed for separate and distinct missions," the Aeronautical Chamber said. "We are the only nation to develop all our fighter planes for combat service in all climates and all temperatures. These machines are operating day and night over all continents and all fronts from Iceland to Australia. Our air forces are the only ones to install all forms of pilot protection in all fighters. They have leak-proof fuel tanks, the most complete armor plate protection, the heaviest fire power, the longest cruising range and the greatest ability to absorb enemy gunfire and sustain damage without being put out of action.

"On the average, our planes carry larger quantities of ammunition. Our cannon-powered fighters use shells twice the size used by any other fighter anywhere. The .50-caliber machine guns on our fighters have a higher muzzle velocity than most enemy planes. Therefore, they are more accurate, more penetrating and more destructive. They will penetrate without deflection the armor plate on any enemy airplane that has appeared to date.

"These Army and Navy fighter planes, each designed for specific work, are the concrete results of years of development work by the experienced aircraft industry working under directives established by Lieut. Gen. Henry H. Arnold, commanding the Army Air Forces, and Rear Admiral John H. Towers, chief of the Navy's aviation, both pioneer airmen who have had continuous experience in air force development from the beginning of military aviation.

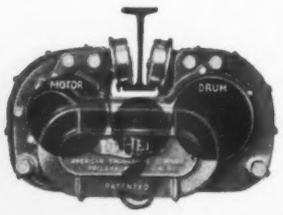
"The Army's Bell P-39 Airacobra, powered by an Allison engine, is the only single-engine fighter in the world with a 37-mm. cannon. It also carries a number of both heavy and light machine guns. Its three-wheel landing gear permits it to operate out of small, temporary or bomb-pocked fields. Developed to be a destroyer of heavily armored bombers and to attack armored columns on the ground, the Airacobra has been in successful combat at heights of 30,000 feet. In recent months it has achieved a better than four-to-one record over the Jap Zero. On the Russian front, official records state, it has bested the Nazis in every fight and they are afraid of it.

"The Army's Curtiss P-40E Kittyhawk and its new brother, the P-40F Warhawk, are the most dis-

The Lo-Hed Hoist Is Applicable To Any Monorail System. There's A Balanced Lo-Hed Electric Hoist For Every Purpose

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

OTHER A-E-CO PRODUCTS:
TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

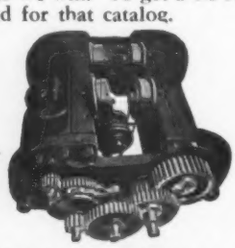


BALANCE makes a difference in electric hoists

It is a fact that balance makes a startling difference in electric hoist design.

The Lo-Hed hoist is unusual in that its motor and drum are balanced around the beam. This means that the hook can be pulled up close to the beam—a desirable plus feature for which you pay no premium. Also, since motor and drum are parallel they can be connected through a train of efficient spur gears. The drum, motor and gearing are housed by easily removable covers.

Lo-Hed hoists have many other service and safety features, shown in the 28-page Lo-Hed catalog. No point of manufacture is more vital to you today than the precision with which Lo-Heds are built. Lo-Heds are as painstakingly made now as they were before the war. On past experience that means good service from a Lo-Hed years after we win. So get a Lo-Hed. Send for that catalog.



AMERICAN ENGINEERING CO.
2410 Aramingo Ave., Philadelphia, Pa.

☐ Please send me your complete catalog of LO-HED HOISTS.

☐ Ask your representative to get in touch with me promptly.

Name .....

Company .....

Street Address .....

City..... State.....
(Please print plainly)

cussed fighters. There have been so many of these planes in action over so many fronts that they have caused high praise and some criticism in comparison with foreign models. The Kittyhawk, Allison-powered, has proven to be the best fighter in desert warfare, better than any of the Axis planes. It has sufficient cooling area to keep it up in extreme heat. All the P-40 fighters are also more than holding their own on the Pacific fronts where they have defeated the Jap Zero in every engagement.

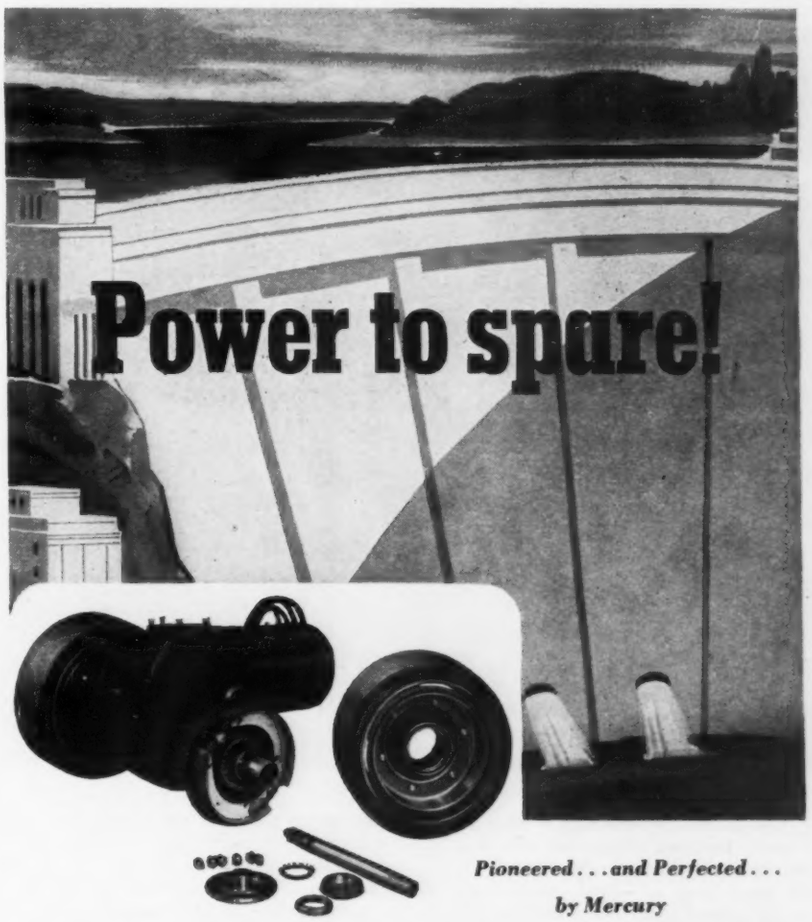
"The Curtiss P-40F Warhawk, its Packard Rolls Royce-Merlin engine being the same type and power of the Spitfire, is in combat service overseas where it is flying as high and effectively as any enemy plane yet encountered. This is the seventh P-40 model, and its performance compares favorably with its contemporaries, the fifth Spitfire, the Hurricane, the eighth Messerschmitt, the last Focke-Wulf experimental and the latest Zero.

"Among the two Navy fighter planes which have won distinction in this war is the Navy's Grumman Wildcat F4F4, a shipboard fighter powered by a twin-Wasp Pratt & Whitney aircooled engine and designed for carrier operations in all climates and against any type of enemy aircraft. It has been in several heavy Navy engagements against the Japs and has a better than three-to-one record over the Zero, although in most battles outnumbered. One Wildcat squadron downed 54 Jap fighters and bombers in a series of engagements and lost only two planes.

"One of the most effective fighters in any service is the Army Air Forces' Lockheed P-38 Lightning, a twin-engine, Allison-powered single-place pursuit ship designed for interception and attack, to dive into enemy fighters and bombers and blast them out of the sky. It carries cannon and machine guns. Hundreds of these planes equip the interceptor squadrons guarding our coastal frontiers on both the Atlantic and the Pacific. The Lightning weighs nearly seven tons, yet can get off the ground quickly and climb to over 35,000 feet with speed. The Germans have tried to duplicate this twin-engine interceptor without success.

"The North American Army P-

"I don't want a doll—I want a welding set." *Drawn for OWI*



Pioneered . . . and Perfected . . . by Mercury

In this unit constructed drive axle assembly

Here's the drive that's really tough! Motor and Drive are a single unit assembly, fully inclosed . . . reduces strain, simplifies construction ● Double Reduction Spiral Bevel and Spur Gears transmit the maximum power with minimum wear. Semi-elliptic Spring Suspension provides smooth riding, reduces shock ● Brakes are in the wheels for greatest safety ● Standardization of Parts and Easy Accessibility reduce maintenance time to the minimum.

For the complete story on the Mercury Drive Assembly and Mercury Material Handling Equipment write for Bulletin 201-5.

Mercury Pioneered and Perfected These Lift Truck Improvements:

The Hydraulic Lift
Snap Action Cam Operated Controller
Single Unit Double Reduction Drive Axle Assembly
All Welded Frame
Special Trail Axle Design

MERCURY MANUFACTURING COMPANY 4140 S. Halsted St., Chicago, Ill.

TRACTORS · TRAILERS · LIFT TRUCKS

51 Mustang, with single Allison engine was designed especially for ground force cooperation. The Mustang combines high speed, high maneuverability and plenty of heavy fire power. The British have been using it with devastating effect in their operations in North France. This plane is rated among the best.

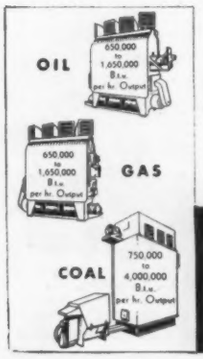
"The Army Air Forces' new Republic P-47 Thunderbolt, with which squadrons are now being equipped, has a 2,000 h.p. Pratt & Whitney, 18-cylinder, aircooled engine and a four-blade propeller. No foreign pursuit ship in service has an engine anywhere near this horsepower, although there is at least one experimental type under development abroad. Although less than 33 feet long and measuring 41 feet between wing tips, it weighs nearly seven tons, and is loaded with extremely heavy fire power. It is capable of first class performance at the highest altitudes.

"The Navy also has a new fighter of great horsepower which is now in production. It is the Vought-Sikorsky F4U Corsair with the 2,000 h.p. Pratt & Whitney engine. The Corsair is designed for take-off from carrier decks. This is one of the fastest planes ever designed anywhere. Its ability to operate from surface ships and speed up to the highest altitudes with heavy armament will make it a terror to the enemy wherever encountered."

TABULATION of Weights of one recent heating job showed that a Dravo Direct Fired system required 350 tons less of vital metals than would be required for a conventional heating plant!

A few years ago a steam plant and distributing system for heat were practically foregone conclusions when plans for industrial buildings were formulated. Today heat produced direct by Dravo Heaters has been proved to be more, economical of materials—manhours—money—and time! It's easier to get materials when you can prove this!

Acceptance and increased use of the Dravo Direct Fired method of heating industrial buildings over the last 10 years merit the thoughtful consideration of anyone—architect—consultant—heating engineer—plant owner—purchasing agent—anyone who has anything to say about specifying or purchasing heating equipment for needed war production plants.



Complete description of construction and function of Dravo Direct Fired Heaters as well as comparison table showing savings they offer in weight, floor space and fuel consumption, will be found in Dravo Bulletin No. 506, available upon request.

DRAVO CORPORATION
HEATER DEPARTMENT
Sales Offices in Principal Cities
DRAVO BUILDING PITTSBURGH, PA.

PRODUCTION CANNON: This big gun of industry, typical of the equipment used to fight the war of production, is an all-welded rotary kiln manufactured by Allis-Chalmers Mfg. Co. for a cement plant.

Cleveland Plants Work Off Backlogs

Cleveland

• • • **While it cannot** be said of 100 per cent of the machine tool industry, there are enough builders who have begun to start cleaning up backlogs that considerable thought is being given to the prospects of continuing in the machine tool business in the future, say a year from now. The possibilities are excellent that builders of certain types of machine tools will be begging for business within another year. The distinct and marked decline of incoming orders during the past 30 days surely tends to point to such a condition.

Furthermore, with plants expanded from 400 to 600 per cent of their original capacity, this backlog will be cleaned up a great deal more quickly than might be expected. These expansion programs, many of them just reaching completion, will be in production on orders from backlog, speeding up production and the day of operation curtailment.

Army Ordnance still is trying to obtain armor plate straightening equipment. They have been on the market for this equipment for some time, and recent instructions to all purchasing depots indicate a need for press brakes and other such machinery.

Construction Volume Gains 13% for Week

New York

• • • **Engineering construction** volume for the week, $157,526,000, is 13 per cent higher than in the preceding week, and almost four times as great as the $42,944,000 reported for the holiday-shortened week in 1941 according to *Engineering News-Record*. Federal construction makes up 91 per cent of the week's volume and is responsible for the 18 per cent gain in public construction as state and municipal work is 0.2 per cent below a week ago. Private construction declines 55 per cent from the last week's total.

The current week's volume brings 1942 construction to $8,133,308,000, an increase of 60 per cent over the total for the corresponding 42-week period last year, and already 38.5 per cent above the volume reported for the 52 weeks of 1941.

Hundreds of Krupp Patents Among 2600 Seized by U. S.

• • • **Seizure of** an additional 2600 enemy patents, principally German-owned, was announced Oct. 14 by Leo T. Crowley, alien property custodian.

Several hundred patents standing in the name of the famous German Krupp works and dealing with heavy machinery, locomotives, metal alloys, diesel engines and internal combustion engines were among those seized. An additional large group consisted of Zeiss-owned patents on cameras, lenses, microscopes, and photometric devices.

Including the seizures announced Oct. 14, more than 13,000 enemy-owned patents and patent applications have been taken over by the Office of Alien Property Custodian. Many of these already have been licensed to American companies.

WHEELABRATOR

AIRLESS ABRASIVE BLAST CLEANING

THIS steel foundry, located in Chicago, has a monthly output of 800 tons. Two WHEELABRATOR Tumblasts (48" x 48" and 48" x 72") clean the entire production plus 85% of this work again after annealing—*making a total cleaning production of more than 1400 tons monthly. LOADS* range from 400 lbs. to more than 2000 lbs. each. *CLEANING TIME* ranges from 4 to 9 minutes for rough cleaning with sprues and heads—8 to 15 minutes after annealing.

QUICK FACTS ABOUT THE PERFORMANCE OF THESE MACHINES

48" x 72" Wheelabrator Tumblast

Only 8 minutes for removing annealing scale and 4 to 5 minutes for rough cleaning are required on average loads weighing from 1,000 to 2,000 lbs. Typical loads are made up of work like the following pieces:

12 large tractor wheels about 2' in dia. and 4" thick, weighing 80 lbs. apiece.

5 spindles weighing 170 lbs. each, 18" high, 2' in diameter at the base, tapering to a 5" shaft.

10 four foot long "L" shaped bars, 8" base, 6" high, weighing about 100 lbs. apiece.

A load of small solid, uncored and ungated pieces which make a compact mass will weigh as high as 3,000 to 4,000 lbs.

48" x 48" Wheelabrator Tumblast

This machine is rated at approximately half the capacity of the 48" x 72". It is helping to produce the tremendous tonnage cleaned each month at this plant. The cleaning speed of this machine ranges from 12 to 15 minutes for removing annealing scale and from 8 to 9 minutes for rough finishing.

TRADE MARK THE AMERICAN MOLDER

AMERICAN FOUNDRY EQUIPMENT CO.

Blast Cleaning and Dust Control Engineers

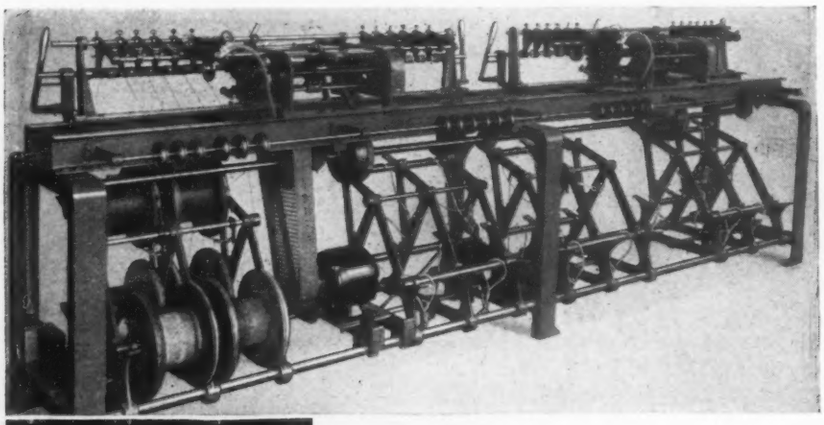
510 SOUTH BYRKIT STREET • MISHAWAKA, INDIANA

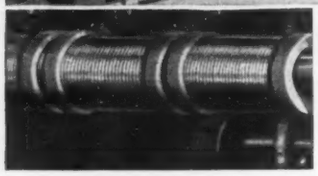
305 Ore Vessels Active; 2,803,090 Tons per Trip

Cleveland

• • • **With the addition** of two boats to the ore fleet of the Pittsburgh Steamship Co., which now has a fleet of 74 boats in service, the number of boats carrying ore on the Great Lakes has reached an all-time high of 305, with a carrying capacity of 2,803,090 gross tons. The entire fleet of 305 are all in commission and at present in ore trade. However, it is expected that before very long some of these boats will be shifted by ODT order into carrying grain, the shipping season for which is about to begin.

The last two boats commissioned by Pittsburgh Steamship Co., Benjamin F. Fairless and the Irvin S. Olds, were put into service on Sept. 15 and Oct. 6, respectively, and were the last of the five new ships that were built for the ore trade.





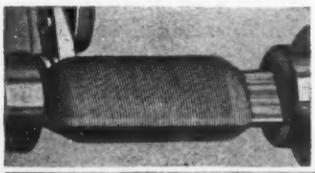
FIDELITY
WIRE SPOOLING MACHINES
. . . from Reels or Coils
. . . to Sticks or Spools

Above: FIDELITY Screw Traverse Machine winds wire on conventional type wooden or metallic spools.

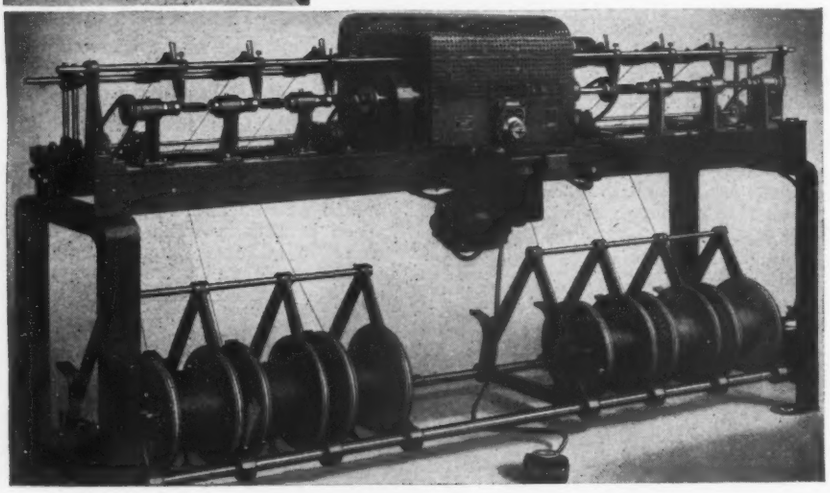
Below: FIDELITY Spooling Machine with new hydraulic control to wind wire on flat or square sticks from brake-controlled reels.

Precision winding at high speed, with unvarying weight and even lay of wire on spool or stick—these are outstanding advantages of FIDELITY Wire Spooling Machines. They are quickly adjusted to required length, thickness or spacing—simple to operate, minimum labor attention and low horsepower.

Write for illustrated folder describing four types of standard machines and operating specifications.



FIDELITY MACHINE COMPANY
3908-18 Frankford Ave. Philadelphia, Pa.



Weirton Tin Plate Plant Shuts on Curtailment Order

Pittsburgh

• • • **The Steubenville plant** of the Weirton Steel Co. has been shut down as a result of a drastic reduction in the manufacture of tin plate products on order of the WPB, it was announced Oct. 15 by E. T. Weir. Under the order, Mr. Weir said, the operations of the tin plate industry will not be over 25 per cent of capacity in the fourth quarter of this year.

The Steubenville plant, which normally has more than 1000 employees on its payroll, is devoted exclusively to the production of tin plate. Tin plate is only one of a group of tin mill products, all of which are affected by the WPB order.

Since the Steubenville plant cannot be operated to produce its one grade of material on a greatly restricted basis, Mr. Weir said, all operations temporarily will be conducted at the company's other tin mill in Weirton which manufactures the full line of tin mill products, including electrolytic tin plate. As many Steubenville employees as possible, including all male employees, are being offered employment at Weirton.

Correction to AISI Third Quarter Steel Report

• • • **Correcting an omission** from the third quarter report of steel production carried in last week's edition of THE IRON AGE, page 110, the following figures should be added.

	Net tons	of Capacity
OPEN HEARTH		
September	6,297,201	98.0
3rd Quarter	19,067,744	96.8
9 Months	56,956,771	97.4
BESSEMER		
September	437,950	79.4
3rd Quarter	1,358,947	80.3
9 Months	4,157,803	82.7
ELECTRIC		
September	331,933	95.7
3rd Quarter	1,022,668	96.1
9 Months	2,905,032	99.5
TOTAL		
September	7,067,084	96.5
3rd Quarter	21,449,359	95.5
9 Months	64,019,606	96.4

The calculated weekly production of all companies by all processes for September, was 1,651,188 net tons in a period of 4.28 weeks; for the third quarter, 1,633,615 net tons averaged over a period of 13.13 weeks; and for the nine month period an average weekly production of 1,641,528 net tons for the 39 week period. All figures are furnished by the American Iron & Steel Institute.

WLB Grants Lukens "Little Steel" Increase

Coatesville, Pa.

• • • **A WLB order** dated Oct. 15, granted workers of the Lukens Steel Co., here, a 5½c. wage increase retroactive to Feb. 15, which places this steel company's wages on the same basis as "big" and "little steel." All other stipulations of the little steel agreement which included the check-off, maintenance of membership and exclusive bargaining rights were also granted, according to the company spokesman,

The company, although no public statement has been issued, is expected to accept the order without protest inasmuch as the order was said to be the result of an agreement reached last April between the Lukens representatives and a panel of the WLB. This also eliminates the supposition that the increase might have been a result of the WLB "show cause" order which was recently issued to 46 steel companies whose union agreements did not equal the "little steel" basis.

Fulton Succeeds Stayman As Head of WPB Stock Unit

Washington

• • • **Ralph Stayman,** warehouse manager for Carnegie-Illinois Steel Corp., resigned last week as chief of WPB's Iron and Steel Branch's available stock unit. A. Oram Fulton, president of the Wheelock-Lovejoy Co., has been appointed as Mr. Stayman's successor. The unit has been moved to Pittsburgh to take part with the Steel Recovery Corp., and WPB's materials redistribution branch in a program to locate, sell and requisition 5,000,000 tons of idle, frozen or excess inventories of steel.

Gets Steel Post in Canada

Ottawa, Canada

• • • **Leslie Clegg** has been appointed assistant to the steel controller in the Department of Munitions and Supply, in charge of cast iron and steel pipe. Mr. Clegg takes over the duties of J. H. Dougherty, who has been on loan from the Canada Iron Foundries Ltd., and has returned to his company at Montreal to assume the posts of vice-president and director to which he was recently promoted.

Need for Scrap Is Canadian Problem Too

• • • **A. W. Brown,** executive assistant to the steel controller, reports that the supply of scrap for armor plate production is causing more anxiety than the supply of iron ore.

L. Levin, steel scrap administrator, said that when readily accessible supplies have been consumed it will be necessary to turn to wrecked ships, old city dumps and other more expensive sources. He said it might be necessary during the winter to use ornamental fences for scrap. Owners of unused mining equipment who cannot readily be found by federal authorities may return to their properties to find the equipment gone, Mr. Levine said. Such scrap is sold to the government-owned Wartime Salvage Ltd., at $2 a ton and removed. The money is held for the owner.

Ask MEAKER!

Equipment for

GALVANIZING

(Electro Process)

PICKLING

CLEANING

PLATING

At your Service . . . the country's leading practical plating engineers.

ADDRESS:

The MEAKER co.

1635 So. 55th Ave., Chicago

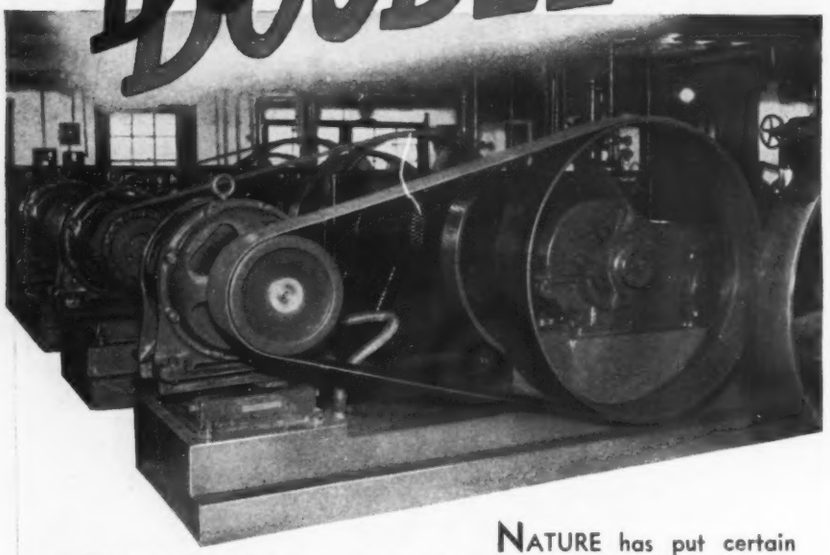
Welding Society Asks Relief from Censorship

New York

• • • **The Welding Research Committee** of the American Welding Society urged less censorship of the results of scientific research in their annual report issued Oct. 10. The committee's voice was raised against censorship by Col. G. F. Jenks, president of the Society and chairman of the committee's Industrial Research Division, who said:

"The division is beginning to feel the results of restrictions in the publication of information because of government censorship. It believes that the greatest benefits to war production and to victory in the field will result from a liberal policy through which the results of research will be disseminated immediately to American engineers and scientists."

THE BELT THAT LIVES A DOUBLE LIFE



NATURE has put certain qualities into leather which make it the superior material for use in the manufacture of transmission belting—providing that it has been selected, tanned and processed to bring out these qualities to the fullest degree.

Schieren's special tannage and oak tanned beltings provide maximum pulley grip, are practically stretch-free and often last up to twice as long on difficult drives, as belts previously used. Whether for high speeds and short centers, or for heavy service on main centers, you'll find that Schieren Leather Belting will require less maintenance and boost your machine production.

Ask your Schieren distributor, or get in touch with our nearest office.

SCHIEREN LEATHER BELTING

PACKINGS AND SPECIALTIES

CHICAGO · SALT LAKE CITY · LOWELL · DENVER · DALLAS
NEW YORK · PITTSBURGH · PHILADELPHIA · NEWARK

SCHIEREN BELTING

Trade Notes . . .

Wisconsin Iron & Bridge Co. has closed its Detroit office and transferred personnel to the principal offices at 5023 N. 35th Street, Milwaukee.

•

Tight Closure Co., Milwaukee, has recently begun custom molding of thermosetting plastic products, and supplying of plastic molds.

•

Centrifugal Casting Co., 1265 Broadway, New York, has been organized to set up, in plants wishing to do precision casting, the process described in THE IRON AGE July 9, p. 39. Y. Pessell, formerly of New Method Casting Co., is owner of the new company.

•

Steel Heddle Mfg. Co., Philadelphia, manufacturer of loom harness equipment, has bought the business of J. F. Johnson & Co., Philadelphia, manufacturers of precision tools, ordnance gages and special machinery. The equipment and most of the employees have been moved to the Steel Heddle building, 2100 West Allegheny Avenue, where the business will be supervised by J. F. Johnson.

•

Roessler Machine Co., Inc., has moved its office and plant to 5201 Magnolia Avenue, Philadelphia.

•

Blanchard Machine Co., Cambridge, Mass., has appointed as its representatives for eastern New York State, northern New Jersey and all of Connecticut, the Rudel Machinery Co., Inc., replacing Henry Prentiss & Co., who have retired from business.

•

Aircraft Development Corp., Summit, N. J., announces its formation with laboratories, shops and offices at that location. The company will engage in the development of untested projects having possibilities for the aircraft field.

•

Bokum Tool Co., Detroit, is now located at 14775 Wildemere. The company occupies a modern, streamlined building having floor space several times the area of its former quarters. This removal marks the third expansion of the company since its beginning in 1931.

•

Kieley & Mueller, Inc., in its 63rd year, has expanded its factory to triple the size of the former plant at Newark. The new factory and general offices, including properties, cover a whole city block at North Bergen, N. J., from 42nd to 43rd Street and through from Tonnelle Avenue to Dell Avenue.

•

Nygaard Machine Co., Madison, Wis., has been organized as a machinery manufacturing enterprise by Halvard F. Nygaard, Harry F. Vogts and Gordon Lampe.

•

The March Engineering Co. has been organized by Herbert Thorndike and Edmund J. Aylward at Oshkosh, Wis., to make machinery and appliances.

•

Palmar Mfg. Co., Waukesha, Wis., has taken over the factory of the former Palmer Products Co., maker of janitor supplies, and will convert it into a war production plant. Stuart F. Auer is manager.

Machine Tool Builders to Compete for Output Prize

• • • **John S. Chafee,** newly elected president of the National Machine Tool Builders' Association, has offered member machine tool companies two trophies for greatest fourth quarter percentage increase in output, it was announced Oct. 15. One trophy is based upon increase in number of machine tools shipped and the other upon increase in dollar value of shipment. Mr. Chafee, who is vice-president of Brown & Sharpe Mfg. Co., Providence, said, "this gives companies of all types a chance to win one or the other."

•

Glueck Resigns as Head Of Copper Recovery Corp.

• • • **Isadore Glueck,** president of the Copper Recovery Corp., has resigned effective Oct. 31, though he will remain a director of the government corporation. Mr. Glueck was granted a leave of absence last spring by Federal Metals Division of American Smelting & Refining Co., of which he was general manager for eastern operations, to build up the CRC to a point where it could act efficiently as an MRC agent for purchasing copper inventories.

•

Canada Fears Shortage of Steel Will Hamper War Effort

Toronto

• • • **Canada is faced** with a serious shortage of steel to provide the raw materials for her rapidly expanding war industry, and primary steel makers in this country are being called upon to greatly extend production efforts. Action taken in the United States toward curbing deliveries of steel in that country, also is expected to reduce shipments of steel into Canada. Following the Washington announcement, C. D. Howe, Minister of Munitions and Supply, who is in England, accompanied by Steel Controller F. B. Kilbourn and Coordinator of Production H. J. Carmichael, sent the following cable to Canadian steel interests:

"The United States has found it necessary to reduce substantially the allotment of steel to Canada for the next three months. It is urgent that this cut be not allowed to interfere with our war production program. We therefore appeal to the steel workers of Canada to exert a titanic effort to expand Canadian steel output in order that our war production may not suffer from the lack of the basic material steel."

In order to meet Canadian steel needs, mills in this country are being asked to step up production during the next three months a minimum of 175,000 tons. According to information made available as of June last, imports of steel from the United States were at an annual rate of 2,000,000 tons, about a third of our total requirements. The reduction by 35 per cent in all strategic materials going to American war plants has been ordered under the Production Requirements Plan in that country, and if the same percentage is applied to the quarterly allotments for Canada, the loss to this country will equal 175,000 tons.

Conserve Cutting Tools at HIGH SPEED

Holding supplies for some future use is not always a saving. True conservation is getting the most production from equipment in current use.

KENNAMETAL IS DIFFERENT FROM OTHER TOOLS

Most tools are conserved by slowing down production rates. KENNAMETAL, however, works best at high speeds for greatest production per tool life.

Past operations in the field and exhaustive tests by McKenna Metals Company show that a deep cut, moderate feed, and high cutting speed assure an excellent machined finish, and highest production rate compared with tool life.

The table below shows correct combinations of speed on steels of various ranges of hardness for best results with KENNAMETAL on your boring, turning and facing jobs.

HARDNESS OF WORK			SUGGESTED SPEED
Rock. C	Brine'l	Scler.	Surface Ft. Per Minute
65	682	93	20 to 30
60	601	83	30 to 50
55	545	75	50 to 80
51	495	69	80 to 80
45	427	62	80 to 100
40	370	54	100 to 150
35	323	46	150 to 220
30	276	42	220 to 300
25	249	38	300 to 400

Write for complete information

INVENTED AND MANUFACTURED IN U.S.A.

McKENNA METALS Co.

144 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

Trade Mark Reg. U. S. Pat. Off.

NAME THE COUNTRY'S GREATEST FOOTBALL COACH!

● What a question . . . and what, you ask, has football to do with *springs?*

Just this. Great coaches are those who best adapt the material available to the changing rules of the game. So, if through trial and error you have determined the characteristics of a spring which seems exactly suited to your requirements, *don't freeze the design* into a final blue print. Let the head coach — your springmaker — check it over first.

Chances are you will save time, money and temper.

Write, wire or better still . . . phone us!

AMERICAN SPRING OF HOLLY, INC.
HOLLY, MICHIGAN

Secondary Steel Jobbers Organize New Association

• • • **Steel warehousemen** from Cleveland, Detroit, Chicago, the Ohio Valley and New England, meeting in Cleveland recently, completed plans for an organization to be known as "The Steel Warehouse Association." The majority of its membership will be warehouses concentrating on the distribution of secondary steel products.

Pending further local organization work and selection of permanent representation, the following temporary steering committee was elected: William Geo. Weiss, Midland Steel & Equipment Co., Chicago; J. E. Lavine, Union Steel Supply Co., Warren, Ohio; Joseph Gendelman, National Sheet Steel Co., Detroit; Sol Friedman, Reliance Steel Corp., Cleveland; Geo. W. Kreer, Lafayette Steel Corp., Chicago.

The purposes of the association are "to foster the trade, commerce and interests of persons engaged within the United States and Canada in the business of maintaining warehouses for the storage of steel in every manner which is in harmony with the public interest and the soundest interests of said industry; to reform abuses relative thereto; to secure freedom from unjust or unlawful exactions; to diffuse accurate and reliable statistics and information; to procure uniformity and certainty in the customs and usages in such trade and commerce, and of those engaged therein; to settle and adjust differences among members and to promote a more enlarged and friendly intercourse among the members; to promote improvement in the service rendered by the industry to consumers of its products and to foster and assist in maintaining sound and equitable relations between the industry, its sources of supply, its customers, its employees, the public and the government."

Brown Heads Iron and Steel Plant Facilities Section

• • • **Appointment of** Edwin H. Brown of Milwaukee, as assistant chief of the Iron and Steel Branch in charge of the Plant Facilities Section was announced Oct. 17 by Hiland G. Batcheller, chief of the branch. Mr. Brown succeeds Don N. Watkins, who has resigned to return to his post as president of Steel Publications, Inc., Pittsburgh. The new appointee is vice-president in charge of engineering of the Allis-Chalmers Corp.

Strains and Stresses - - *"At the Metal Show"*

LINDBERG FURNACES
...AND SO I SAID TO THE WPB....
LET'S SEE THE MOVIE ONCE MORE, DEAR.. MY CORNS HURT!
WE'VE SEEN IT EIGHT TIMES! I'M DEVELOPING CORNS
LADY, WILL YOU KINDLY REMOVE YOUR HAT?
PSST! JOE, YOUR WIFE'S BEHIND YOU!!
BABE, LET'S YOU AND I GO PLACES AND DO THINGS TONIGHT, H'M-M?
SO THAT'S THE HIGH TEMPERATURE JOB HE HAD TO GET SOME DOPE ON!!
COME UP TO MY ROOM... I'VE GOT A FORMULA FOR QUENCHING DRY TONSILS THAT I WANT TO SHOW YOU
I'VE GOT A SPLITTING HEADACHE... ATE SOME BAD FOOD LAST NIGHT!
YEAH, YOU PROBABLY GOT SOME BAD CORN!
EIGHTEEN WEEKS HE WANTS FOR DELIVERY.... AND HIM A FRATERNITY BROTHER OF MINE!
BID HIX

Manpower Problems; Stabilization Uppermost in Labor Field

• • • **Still most prominent** in the minds of those concerned with labor and production this week were the subjects of possible manpower legislation, and the current and future moves toward stabilization.

Heading the manpower problems was the probability of early drafting of 18 and 19 year olds which would seriously affect many companies who have been training this class to fill skilled positions of presumably more eligible men.

Figures published in THE IRON AGE last week showed that our total labor force of about 54,000,000 persons during the summer had already shrunk to 52,000,000 due in great part to the enlistment of youngsters and the return of the 18-19 year group to schools and colleges. If in addition to this loss, the ranks of labor are further thinned by a draft of those youths who have stayed in industry, another great groove will be carved in our theoretical labor force.

However, an encouraging and probably more permanent benefit is offered by the suggestion that men of an older age group will be released from the armed services to take up some of these vacancies. Thus, training programs which have possibly been wasted on youths who are now about to be drafted may be turned to more lasting benefit on older men who will then be Army-free.

For those who wonder what is being done about training new workers for skilled applications, recent figures from the Federal Committee on Apprenticeship reveal that 908 new apprenticeship programs have been approved since Oct., 1941, and that 1974 programs are now operating as compared with 1066 a year ago.

Of the 1974 programs now operating, 1086 are programs to meet the specific training requirements of individual establishments in one phase or another of war production. The remaining 888 are trade programs which train apprentices in recognized crafts. 465 of the programs are related to the machine tool industry.

Other manpower problems such as racial and sex prejudice in hiring, migration, piracy, and lack of upgrading to maximum skills are fast forcing employers into exclusive use of a federal hiring agency, the United States Employment Service.

This, although remote from the old American conception of free enterprise in entirety, has its advantages both to the employer and the manpower program as a whole.

Labor Highlights

- *Draft of 18-19 Year Olds to Affect Labor Supply*
- *Apprenticeship Programs Grow*
- *Exclusive Hiring Agency Imminent*

The employer has the advantage of utilizing a nation-wide network of employment offices having at their command the finest and most up-to-date statistics on labor supply ever compiled. Through these facilities the employer is enabled to know where and in what quantity specific types of labor are available and enjoy a rapid means of making contact. For the benefit of the war program generally, the USES works under an iron-bound policy which does not permit any discrimination against women or the negro regardless of union objections, eliminates piracy, migration of needed workers and, through excellent job analysis, fosters consistent upgrading to maximum skill.

These are reasons for McNutt's statement saying, "All hiring should be done through the USES. That enables the orderly allocation of workers to war industries. It prevents uncontrolled migration of workers into the cities. It is the only way of keeping complete track of both men and jobs so that they can be watched."

Compulsory use of the USES as the universal hiring agency for all war industries, although not sounding very democratic, suggest a way to manpower stabilization without resorting to legislative job freezing. Stabilization of labor is sure to come; the painless way should be considered first.

•

Individual Increases Granted Without WLB Approval

Washington

• • • **In an order** issued Oct. 14 by the War Labor Board, individual increases in pay based on promotion, length of service and similar reasons were exempted from dependence on Board approval.

The classifications exempted from the control include individual promotions or reclassifications, individual merit increases within established rate ranges, increases under an established plan based on length of service, piecework or incentive plans and those resulting from the operation of an apprenticeship system.

The Board made clear that the reasoning behind their decision was that these individual increases would not visibly affect inflation such as would be the case with widespread general increases.

•

WLB Grants Pay Raise To Auto Tool Makers

Washington

• • • **WLB granted** a 10c. an hour pay increase Oct. 10 to the tool and die workers of the "captive shops" of Chrysler, General Motors and Ford in Detroit. At the same time the Board refused a general wage increase to 80 job shops represented by the Automotive Tool and Die Association in a move to stop the spiraling of wages, create a state of wage equality and to stop pirating of labor between the job shops and the "captive shops."

The increase, to the Chrysler and G-M men, is actually only 6c. an hour due to their recent 4c.

general increase which was taken into consideration. The increase was made retroactive to June 1, in the case of Ford and Chrysler; April 28, for G-M.

A maximum rate of $1.75 an hour was placed on the wages of the job shop workmen which is intended to stop the rising wage spiral and discourage pirating of help from the captive shops. At the same time the Board increased the minimum wage standard for tool and die makers in the job shops to $1.50 an hour from $1.40 an hour.

Die makers in the captive shops also had their minimum raised from $1.25 or $1.30 to $1.40 an hour and where the present minimum was below $1.25 an hour 15c. was added. Maximum increase above the minimum was set at 20c. an hour. The UAW-CIO was the bargaining agency.

•

NLRB Bans Wright Independent Union

Washington

• • • **The NLRB said amen** to the Wright Aeronautical Employees Association (independent) in a directive issued Oct. 12 ordering the Wright Aeronautical Corp. Paterson, N. J., to withdraw recognition of the association as bargaining agent for their 18,000 worker-members. The order came as the result of a complaint from the International Union of Aircraft and Agricultural Implement Workers of America (CIO) who claimed that the independent union was company-dominated.

Joseph Adams, regional director of the CIO union declared that he would now request the NLRB to order an immediate election.

UMW Agrees to Six Days Demands Premium Pay

Cincinnati

• • • **The United Mine Workers** (now ex-CIO) agreed last week during their convention, to the six day working week suggested originally by Harold L. Ickes, Secretary of the Interior and Fuel Administrator.

This recomendation, brought in as part of the report of the scale committee, was approved with the express understanding that time and one-half pay would be granted for the sixth day. The miners have previously worked a five day, 35 hour week.

A general wage increase demand is also expected to come up when current contracts expire in April. No exact figures were quoted regarding the pay demand but increases of as much as $2 a day over the present basic rate of $7 a day are expected.

•

Labor Supply to Affect War Contract Placement

Washington

• • • **Government agencies** have been directed by WPB chairmen, Donald M. Nelson, to avoid so far as possible contracting for the production of war materials in areas where labor shortages are known to exist. This, for war contract seekers, is another repercussion from the manpower situation. Certification of areas as either critical labor areas or not will come from the War Manpower Commission.

The new directive, issued Oct. 11, also explicitly authorizes war procurement agencies to pay higher prices if necessary to comply with the directives five point policy which rules: (1) Delivery or performance when required. (2) Placement of contracts with concerns requiring least new equipment. (3) Avoidance of critical labor areas. (4) Placement with most capable firms. (5) Adherance to a policy of distributing the work as generally as possible.

•

Absentee Rate Seen Increasing in Steel Industry

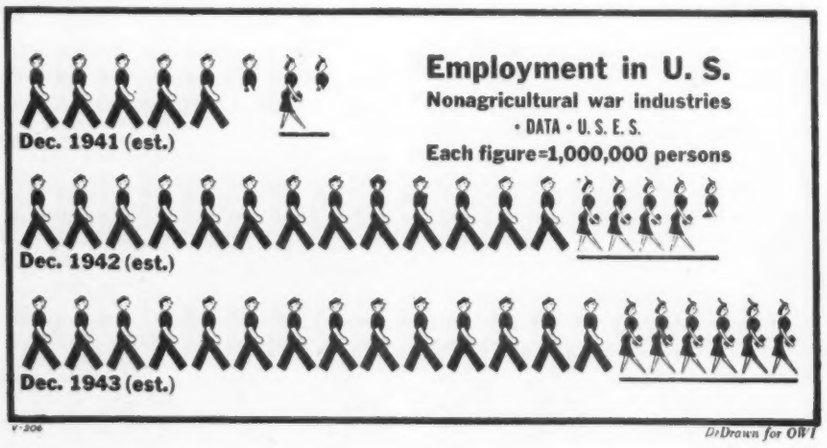
Pittsburgh

• • • **Absenteeism has** been increasing in the steel industry within recent weeks but is not believed to have as yet become a serious problem. Nevertheless indications are that a considerably larger number of employees are failing to show up for work than was the case a few months ago. Steel companies which are "on their toes" in such personnel matters, are already launching specific surveys to determine the most prevalent reason for unscheduled layoffs by individual employees.

Actual absentee figures are not yet alarming but some industrial managers believe, unless the present upward trend is checked, actual production of steel may be hampered. The lack of sufficient skilled workmen, the impending increase in draft requirements, and the dwindling of so-called "labor reserves" makes it necessary many times to replace skilled workmen, absent from work, with employees not thoroughly conversant with the particular jobs.

Some companies several years ago bore down heavily on "repeaters" who were found to take time off following paydays, the result being that in those particular companies absenteeism has not yet become a factor. By and large, however, the steel industry is expected to experience belatedly the same trend in absenteeism which has been noted for months in specific war industries where the problem has become so serious that various methods have been devised to reduce the unscheduled time off.

Some personnel managers see a definite threat to industrial safety if absenteeism continues to grow. Industrial accident rates are already climbing because of new employees, younger and untrained



workers, and older workers (recently hired) who previously had not been too well grounded in safety methods. Absenteeism comes into the picture when a skilled and competent workman suddenly takes time off and must be replaced in some instances by available workmen who may not be too familiar with the work and safety practices. Many of these men constitute potential accident hazards which is directly due to the absenteeism of skilled workmen.

Pending the results of actual surveys now being made, unofficial reasons being given for the increase in absenteeism run pretty much as follows: The increase in "night life" with its attendant after effects; the knowledge by some employees that under present conditions they will not lose their jobs if they are away from work; the general effect of war tenseness; the lack of time for some workmen to do shopping made possible by increased pay envelopes; the appearance of seasonal colds; and the granting of retroactive wage increases.

•

One Million Homes a Year Seen As Post-War Prospect

Chicago

• • • **One million homes** a year for many years after the war is the post-war prospect of the construction industry, according to D. W. Kimball, president of the Associated General Contractors of America.

Mr. Kimball said that the bulk of the post-war housing activities will lie in the moderate cost urban home, built to sell at $2,500 to $3,500. He also predicted that there would be substantial rebuilding of poorly planned cities, large scale projects to improve whole sections of the nation by providing irrigation, flood control and water power. He also predicted an expansion of the entire American transportation system and the building of plants for new industries born of wartime technological advancement.

He warned, however, that stabilization of employment will be major responsibility of the industry after the war. Mr. Kimball's comments were made to L. Lyon, of the Chicago Association of Commerce, in a nation-wide radio broadcast.

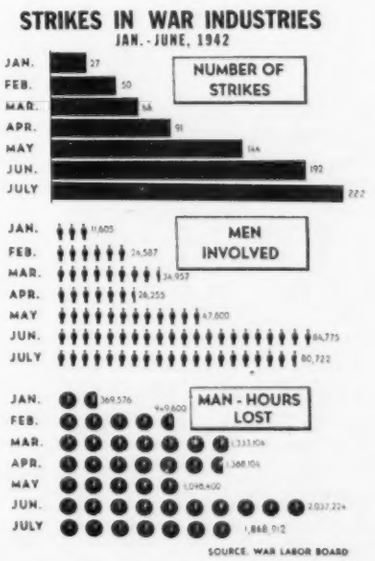
Who's Got the Auto? Any One of 24 Workers Might Know

Chicago

• • • **There are** 24 steel workers in the Gary works of Carnegie-Illinois Steel Corp. who could probably make good use of an accountant to keep track of the whereabouts of a car which they all own jointly.

The 24 steel workers all have a financial interest in a station wagon which they use on a 24-hr. schedule to get to the plant from their homes as their contribution to the plant's share-a-care plan.

The men have worked out a schedule covering three shifts. At 8 o'clock each morning a group of men arrive at the plant in the station wagon. A group leaving the mill then drives the car back to Wheatfield, Ind., about 40 miles from Gary. At 4 p.m., another group drives the car back to the plant for the following shift, whereupon the men who began work at 8 a.m. drive the car back to Wheatfield. Another group on the midnight shift drives the car back to the plant when they come to work. Thus the car provides transportation on a 3-shift basis.



STRIKES ARE INCREASING: So shows this chart of the National Association of Manufacturers who prepared it to back up their point of view that strikes are not only increasing but becoming an effective slow-down for war production.

Canada to Shift 50,000 Per Month into Industry and Army

Ottawa, Canada

• • • **Announcement** will be made within a few days by National Selective Service and the Wartime Prices and Trades Board, regarding organization to channel 50,000 men and women a month into Canada's war industry and the army. A conference in this connection originally was planned for an earlier date, but has been delayed until the set-up is completed. Once that is accomplished a speeding up of the curtailment of less-essential industry is looked for.

For the remainder of this year Canadian war plants require at least 30,000 workers a month to bring the total to 1,000,000 by the end of December. At the estimated peak production early next year, war industries alone are expected to employ 1,100,000 persons. Army requirements under the draft plan are running 20,000 a month and there has been no indication of a change in that figure.

•

Knudsen Says Michigan Is To Produce Half of Bombers

Detroit

• • • **At least half** of the parts and assemblies required in the heavy bomber program will be built in Michigan, Lieut. Gen. William S. Knudsen told the Economic Club, Oct. 12. He said 500 plants in the Detroit area now had 500,000 men and women engaged in arms output. Current national output of war goods, he said, is about four billion dollars' worth a month.

•

Canada Plans Further Curtailment of Gold Mining

Ottawa, Canada

• • • **Canada's** Prime Minister, W. L. Mackenzie King, stated that the government has found it necessary "to issue instructions that plans be formulated for further curtailment of gold mining, as well as other non-war industries." The policy was adopted to meet "the urgent and immediate need for men and materials required for Canada's war effort" and did not indicate any lack of confidence by the government in gold or in the future of the gold mining industry," the Prime Minister stated.

Ceilings for Malleable Castings Established at October, 1941, Levels

• • • **Malleable iron castings** prices have been set by OPA at approximately the maximums attained during Oct. 1 to 15, 1941. In the absence of a specific price order, malleable castings have been under the General Maximum Price Regulation previously. The new schedule is No. 241, effective Oct. 21, 1942. It provides:

(1) Maximum prices for each seller of malleable iron castings shall be the highest prices the seller was charging for the same or substantially the same castings between Oct. 1 and Oct. 15, 1941, inclusive; or

(2) If the castings to be priced were not sold between Oct. 1 and Oct. 15, 1941, maximum prices are to be computed according to the pricing method and costs and profit margins in effect for the seller on Oct. 15, 1941 (with certain exceptions for overhead rates, costs of materials, and outside machining).

In determining the prices of castings which are not substantially the same as those sold by the seller between Oct. 1 and Oct. 15, 1941, the seller must use the pricing method used by him on Oct. 15, 1941, employing the various cost and profit factors used by him on that date, with the following three exceptions:

(1) Direct material costs must be computed on a basis no higher than the actual costs to the seller of such materials, not to exceed the applicable OPA maximum prices, whether these costs are higher or lower than those prevailing on Oct. 15, 1941.

(2) Costs of machining let out to other firms may be computed on the basis of the seller's actual costs, not to exceed OPA maximums, even though these are higher than costs on Oct. 15, 1941.

(3) Overhead or "burden" rates are to be computed on the basis of the seller's actual costs and volume of production for the period from Jan. 1, 1942, to June 30, 1942, with labor costs adjusted, however, on the basis of Oct. 15, 1941, wage rates. The seller is permitted to use such overhead rates even though these may be higher than the rates used on Oct. 15, 1941.

The regulation requires that by Nov. 20 each seller of malleable iron castings must file with his regional OPA office three copies of his published price lists in effect between Oct. 1 and Oct. 15, 1941. By Dec. 20, he must file with the OPA regional office information as to wage rates, profit margins and pricing methods in effect for him on Oct. 15, 1941.

•

More MRC Prices Set

• • • **Prices at which** the Metals Reserve Co., a government procurement agency, may buy idle or frozen stocks of tin oxide and tin anodes were established Oct. 15 by OPA.

For dry weight of tin content, properly packed in wood containers, f.o.b. point of shipment, the prices are:

	Cents Per Pound
Virgin tin oxides sold by consumers	66
Reclaimed tin oxide sold by consumers	63
Virgin or reclaimed tin oxide sold by producers	55.75
Unused tin anodes sold by a consumer	60
Partially used tin anodes sold by a consumer	56
Used or partially used tin anodes sold by a consumer who cast the anodes	54

The prices are contained in Order No. 4 under Maximum Price Regulation No. 204, which covers idle or frozen materials sold under Priorities Regulation No. 13, and became effective Oct. 15.

•

Chemical Firms Licensed

• • • **Uniform licensing** and registration provisions for distributors of chemicals were written into 14 maximum price regulations and schedules Oct. 12 by OPA.

The provisions automatically grant a license as a condition of doing business. Courts may suspend the license of a person who, after a warning from OPA, violates a price regulation.

The amendments apply to the following schedules and regulations:

Amendment No. 1 to Revised Price Schedule No. 21—Formaldehyde.
Amendment No. 1 to Revised Price Schedule No. 31—Acetic Acid.
Amendment No. 1 to Revised Price Schedule No. 34—Wood Alcohol.
Amendment No. 3 to Revised Price Schedule No. 38—Glycerine.
Amendment No. 3 to Revised Price Schedule No. 42—Paraffin Wax.
Amendment No. 2 to Revised Price Schedule No. 78—Oxalic Acid.
Amendment No. 3 to Revised Price Schedule No. 79—Carbon Tetrachloride.
Amendment No. 3 to Revised Price Schedule No. 80—Lithopone.
Amendment No. 2 to Revised Price Schedule No. 98—Titanium Pigments.
Amendment No. 1 to Revised Price Schedule No. 99—Acetyl Salicylic Acid.
Amendment No. 1 to Revised Price Schedule No. 103—Salicylic Acid.
Amendment No. 1 to Maximum Price Regulation No. 179—Pine Oil.
Amendment No. 2 to Maximum Price Regulation No. 191—Cotton Linters and hull fibers.
Amendment No. 1 to Maximum Price Regulation No. 192—Imported Cresylic Acid.

•

Dislocated NE Steel Tonnage

• • • **The dislocated tonnage** provisions of Revised Price Schedule No. 49 (Resale of Iron and Steel Products) may be used in establishing prices on dislocated tonnage shipments of the new National Emergency grade steels, the OPA said Oct. 16. Dislocated tonnage shipments are shipments to points outside the seller's normal marketing area. On such shipments, the dislocated tonnage provision of the schedule permit the seller to recover the greater part of the added costs of transportation.

•

Review of Contracts Covered

Washington

• • • **Manufacturers** whose over-all profits are under review by Governmental price adjustment agencies will not be subject to simultaneous review of individual contracts by contracting officers, according to a joint statement issued last Saturday by the Price Adjustment Boards of the Army, Navy and Maritime Commission.

This policy is designed to eliminate duplication by permitting companies to consolidate all their individual contracts for review, on an over-all basis, by the price adjustment agency assigned to them, instead of having each individual contract reviewed by contracting officers.

Contracting officers will be informed when over-all review has been started in order that companies will have only one group with which to deal. Contracting officers also will be notified when review has been concluded and an agreement reached with a company by any price adjustment board, section or branch. Thereafter, while contracting officers may enter into new contracts, they will not seek price reductions on existing contracts except on deliveries to be made after the expiration of the period covered by the agreement. However, should the company find that profits for the balance of the period covered by the agreement are proving higher than contemplated at the time of the agreement, it may volunteer further price reductions.

The three Price Adjustment Boards announced that they regard voluntary re-negotiation of contract prices as part of the normal procedure of orderly and economical procurement, irrespective of statutory provisions. Periodical review of production costs and contract prices, and adjustment thereof by agreeemnt, is inherent in any contracting situation.

Special Allocations for Warehouses Begin Nov. 1

Washington

• • • **As exclusively reported** in THE IRON AGE of Sept. 17, page 137, the WPB Iron and Steel Branch has amended the steel warehouse order to provide for the earmarking of tonnages for warehouse destination out of periodic production directives to the mills. This action was formally announced on Oct. 14 by Hiland G. Batcheller, chief of the Iron and Steel Branch, in an amendment to order M-21-b.

The special allocations came about because WPB is anxious to maintain warehouse stocks. Warehouse business has been threatened because it takes a rating of AA-3 to get some steel products and warehouses are compelled by WPB orders to sell on ratings as low as A-1-a.

The earmarking will begin Nov. 1, and virtually all of the steel allocated will flow directly into the war production program or into other essential uses, such as mine, agricultural, railroad or power plant maintenance.

The amended order permits the sale of steel products for small percentages sold for maintenance and repair on low preference ratings, and certain other items such as wire, nails, staples and farm fence may be sold by warehouses for repair purposes without a preference rating.

The over-all monthly tonnages needed for distribution by warehouses will be determined by the Iron and Steel Branch. The tonnage required then will be divided among producing mills, according to the pattern of orders on hand from the warehouses. Varying regional requirements as well as the overall production obligations of each mill also will be taken into consideration.

The instructions sent to the mills are called "warehouse load directives" and generally instruct the mill to consider a specific steel product (such as structural shapes, etc.,) as a monthly "warehouse load."

Producers so instructed must accept and fill or ship each month properly rated purchase orders received from warehouses up to the amount of the warehouse load, notwithstanding any higher rated orders for such material on a mills books from other customers.

Warehouses are required to place their orders at least 30 days prior to the beginning of the month in which delivery is requested. If this requirement is not observed, the mill is not obligated to schedule the order as part of its warehouse load for the month.

•

Utilities Restricted

Washington

• • • **The amount of** scarce metals that public utilities may use for maintenance and repair of transmission and distribution systems during the last quarter of 1942 has been cut approximately 40 per cent by WPB in amendment to order P-46. Previously a utility could use as much scarce material as it used during a corresponding quarter in 1940. The metals affected are chiefly copper and steel and the cut is possible largely because all non-essential utility maintenence and construction has been halted.

The amended order also requires for the first time that electric utilities make at least 75 per cent of their wire, cable and bus bar purchases from the inventories of other utilities instead of from manufacturers. Gas and water utilities must get at least 40 per cent of their pipe and similar supplies from the inventories of other gas and water utilities.

The term "inventory of a utility" is defined, making it clear that it does not include material a utility obtained under a project rating for the construction of a specific war project. Of course, any material left after the completion of the war project goes into the inventory of the utility and becomes subject to control under the order.

Public sanitation utilities, under the amended order, are to send all communications and applications to the Bureau of Governmental Requirements instead of to the Power Branch as provided by P-46. The Governmental Requirements Bureau will get out an order controlling public sanitation utilities. All ratings assigned by the order for materials required for maintenance and repair have been raised from A-2 to AA-5 with a rating of AA-2 for emergency repairs.

•

Order L-193 Improved

• • • **An extension** of 30 days for filing of production schedules under Limitation Order L-193, establishing control of conveying machinery and mechanical power transmission equipment, was provided in an amendment to the order Oct. 17. The amendment contains two other provisions to facilitate the operation of L-193, which went into effect Oct. 7. They are:

1. Minor mechanical changes with respect to transmission of authorizations and certifications.
2. Elimination of necessity of advance approval of Army, Navy and Maritime Commission orders.

•

Scrap Reports Due Earlier

Washington

• • • **Reports required** under the iron and steel scrap order, M-24, must be filed by the 10th of each month, it was announced recently by WPB. Previously the reports were to be filed by the 15th of each month. The change was made by a revision of order M-24.

At the same time, WPB amended order M-24-c to require segregation of low-phosphorous and low-sulphur stainless steel turnings. Segregation prevents the indiscriminate melting of scrap, thus helping to conserve the nation's supplies of scarce alloying metals.

•

Export Licenses Extended

Washington

• • • **Provision for** two-month extensions of certain individual export licenses, as an aid to United States exporters who face delays in filling orders for commodities destined for South and Central American republics, was announced on Oct. 14 by the Board of Economic Warfare.

Validity of the individual export licenses affected will be extended for two months beyond the original expiration date under the following circumstances:

(1) A cargo space application

has been made on form BEW-138; (2) the shipping priority rating on the corresponding export license is "AA", "A" or "B"; (3) the license is scheduled to expire within two months from the date of certification of the freight space application, and (4) the certification is to be made more than five days prior to the expiration date of the export license.

An appeal procedure has been established by the Office of Exports as a service to exporters who feel that, in certain cases, higher shipping priority ratings should be given certain of their shipments. Whenever justified by the exporter's appeal, a higher rating will be recommended by the Office of Exports.

•

Scale Production Curtailed

• • • **Production of** commercial scales for retail trade and production of household scales were prohibited under an order Oct. 10 restricting the manufacture of all types of scales. Other important provisions of Limitation Order L-190 that affect the manufacture of scales are:

1. Limitation of the production of clinical, mailing, parcel post and dietetic scales to 25 per cent of 1941 production.
2. Limitation on manufacture of industrial and scientific scales for inventory to 30 days' supply.
3. Prohibition of the use of brass in major parts of industrial scales, and in all weights except small ones used for analytical balances.
4. Restriction of the sale of industrial, scientific, clinical, mail and parcel post scales to rated orders.
5. Restriction of the sale of dietetic scales to doctors' prescriptions.

•

Regulation 16 Issued

• • • **Appeals by** manufacturers for relief from the restrictions imposed by 31 of the limitation and conservation orders issued by WPB must be filed in WPB's field offices, beginning Oct. 22, by the terms of Priorities Regulation No. 16. Issued Oct. 15, the regulation also requires the use of form PD-500 when filing an appeal. Appendix A to the new regulation lists the orders which are to be appealed from only through field offices. They are:

L-5-c, domestic mechanical refrigerators; L-6-c, domestic laundry equipment; L-18-b, domestic vacuum cleaners; L-21, 21-a, phonographs, etc.; L-27-a, vending machines; L-29, metal signs; L-33, portable electric lamps; L-49, beds, springs and mattresses; L-59, metal plastering bases; L-62, metal enameled furniture; L-64, caskets, etc.; L-73, office supplies; L-77, metal windows; L-78, fluorescent lighting fixtures; L-80, outboard motors; L-81, toys and games; L-83, industrial machinery; L-84, electric heating pads; L-91, commercial laundry equipment; L-92, fishing tackle; L-93, golf clubs; L-98, domestic sewing machines; L-104, metal hair pins; L-108, metal working equipment; L-131, officers' insignia; L-135, wood upholstered furniture; L-136, church goods; L-161, electric fuses; M-11-b, zinc; M-126, iron and steel.

Appeals from orders not included in Appendix A should be filed directly with WPB in Washington. If no particular form is prescribed, the appeal should be made by letter, in triplicate, (marked Ref: L or M Order No. —), stating in detail the grounds for the appeal.

•

Order P-107 Revoked

• • • **A revocation** of Amendment No. 1 Order P-107, which assigned a preference rating of A-3 to producers of automotive replacement parts, was signed Oct. 17. The original order expired on March 31, 1942. Amendment No. 1 extended the terms of the order until Dec. 31, 1942. Application of PRP to automotive replacement parts rendered the amendment ineffective.

•

Carbon Black Allocation

Washington

• • • **Effective Nov. 1,** a complete allocation system for furnace-type carbon black has been established by WPB's Director General for Operations in General Preference Order M-244. Persons seeking authorization to accept delivery are required to file Form PD-600, while those seeking authorization to make delivery are required to file Form PD-601. Purchase, delivery and use of 100 lb. or less of furnace-type carbon black to any one person in any one month are exempted from the restrictions of the order.

•

Electrical Instruments

• • • **Strict control** was placed over small panel electrical combat measuring instruments by Limitation Order No. L-203, announced Oct. 14. "Combat measuring instrument" is defined under the order as any new measuring mechanism of the kind or type named on List A (attached to the order), and used on or in the operation of any vessel built for the Army, Navy, Maritime Commission, War Shipping Administration, on or in any aircraft, or on or in any equipment prescribed for field or combat use by the Army or Navy of the United States.

The order provides that no manufacturer shall accept any purchase order for combat measuring instruments of the kind named in List A, unless it is an approved purchase order. An approved purchase order is one that is placed by the Army, Navy, Maritime Commission or War Shipping Administration, or one for aircraft, or any other order approved by the Director General for Operations of WPB. Monthly delivery schedules must also be filed by suppliers of combat measuring instruments. This requirement will enable the WPB to equalize the production of instruments throughout the industry.

•

Order M-154-a Revoked

• • • **Supplementary Order M-154-a,** which places polyvinyl butyral under allocation control, was revoked Oct. 12. Order M-10 was amended Oct. 10 to include all vinyl polymers in its allocation control, thus obviating the need for M-154-a.

•

M-24-c Amended

• • • **Conservation Order** M-24-c, which makes mandatory the segregation of alloy steel scrap, was amended Oct. 13 to require segregation of low-phosphorus and low-sulphur stainless steel turnings.

•

Rating on Export Orders

Washington.

• • • **WPB last Thursday** told exporters who have had BEW export licenses issued to them before Oct. 1 that they may fill this class of order. At the same time a rating of AA-2X was granted to accomplish this purpose. This action was embodied in an amendment to Order M-148.

•

Hand Tool Schedule Changed

Washington

• • • **WPB has changed** Schedule 1 of Order L-157, covering sizes and standards of hand tools. Shovel manufacturers are now permitted to finish blades and handles in accordance with Army and Navy specifications. Two types of coal yard scoops (No. 6 and 10) are eliminated and one type (No.

8) is substituted. Manufacture of B and C grade gravel, round point scoops is now permitted.

•

Rating for Hand Tools

Washington

• • • **An A-9 rating** was assigned by WPB last Saturday to the sale and delivery of hand service tools in an amendment to Order E-6. Further limitations were placed on the types of alloy steel from which hand service tools can be manufactured. Schedule B of the order lists the AISI-NE classifications which may be used in hand service tool manufacture. Originally there were eight classifications listed. The amendment lists only five, the effect being to permit the use of a lesser amount of critical alloying elements, particularly molybdenum. It is provided, however, that any alloy steel in a series not listed, but which has been received by a producer for use in the manufacture of hand service tools before Nov. 1, may be used.

•

Priorities Stop New Plastic

Pittsburgh

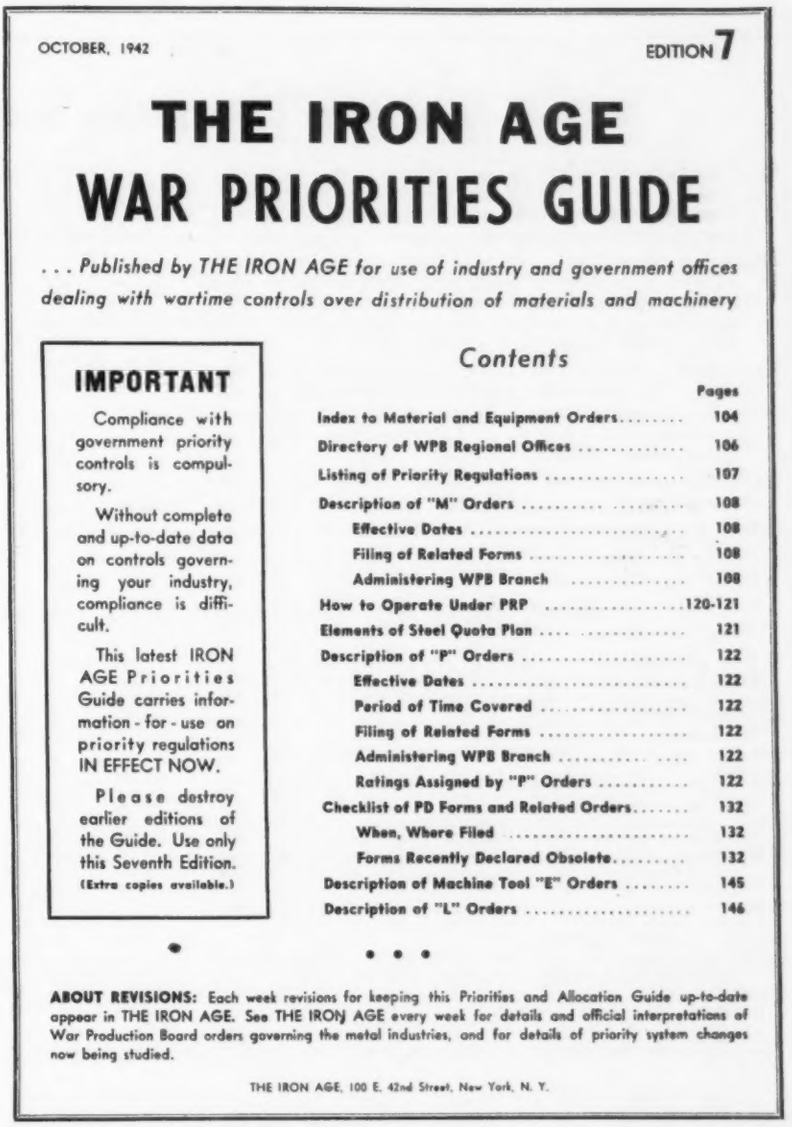
• • • **The development** of an entirely new transparent plastic claimed to have many times the abrasion resistance of other clear plastics has been announced by the Columbia Chemical Division of the Pittsburgh Plate Glass Co.

Because of priorities and other restrictions, however, this new plastic is not yet in commercial production, and is not expected to be available for any but experimental purposes for several months.

The new plastic, called C. R. 39, is one of a group of resins resulting from many years of research activity. It does not dissolve in acetone, benzine, toluene, alcohol, gasoline, or any of the common solvents, according to the company.

Its resistance to abrasion is said to be 10 to 30 times greater than other clear plastics. It retains its shape even when exposed to high atmospheric temperatures and can be formed into large sheets, either clear or laminated, by the application of extremely low pressures. In transparent sheets its strength, weight, clarity, and impact resistance are comparable with other transparent resins.

In its primary form C. R. 39 is a clear, low viscosity liquid which, in the presence of a catalyst and heat, hardens into a crystal-clear solid. Layers of fabric, paper and the like can be impregnated with the liquid material and cured under low pressure to form sheets or shaped objects with a minimum of expense for tooling.



OCTOBER, 1942 EDITION 7

THE IRON AGE WAR PRIORITIES GUIDE

. . . Published by THE IRON AGE for use of industry and government offices dealing with wartime controls over distribution of materials and machinery

IMPORTANT

Compliance with government priority controls is compulsory.

Without complete and up-to-date data on controls governing your industry, compliance is difficult.

This latest IRON AGE Priorities Guide carries information-for-use on priority regulations IN EFFECT NOW.

Please destroy earlier editions of the Guide. Use only this Seventh Edition. (Extra copies available.)

Contents

	Pages
Index to Material and Equipment Orders	104
Directory of WPB Regional Offices	106
Listing of Priority Regulations	107
Description of "M" Orders	108
Effective Dates	108
Filing of Related Forms	108
Administering WPB Branch	108
How to Operate Under PRP	120-121
Elements of Steel Quota Plan	121
Description of "P" Orders	122
Effective Dates	122
Period of Time Covered	122
Filing of Related Forms	122
Administering WPB Branch	122
Ratings Assigned by "P" Orders	122
Checklist of PD Forms and Related Orders	132
When, Where Filed	132
Forms Recently Declared Obsolete	132
Description of Machine Tool "E" Orders	145
Description of "L" Orders	146

• • •

ABOUT REVISIONS: Each week revisions for keeping this Priorities and Allocation Guide up-to-date appear in THE IRON AGE. See THE IRON AGE every week for details and official interpretations of War Production Board orders governing the metal industries, and for details of priority system changes now being studied.

THE IRON AGE, 100 E. 42nd Street, New York, N. Y.

PRIORITIES INFORMATION IN NEW FORM: The Priorities Staff of THE IRON AGE has brought out a brand new compilation, answering thousands of questions on the confusing subject. Part of the material covered is shown in this illustration of the title page. Prices for extra copies (please send coins or stamps for orders for one dollar's worth or less) are: One to ten copies, 50c. each; 11 to 100 copies, 40c. each; 101 to 300 copies, 35c. each, and 300 or more copies, 30c. each. Write, telegraph or telephone THE IRON AGE, 100 E. 42nd St., New York.

•

Telephone Sets Curtailed

Washington

• • • **Manufacture** of telephone sets will be stopped in 30 days under the terms of Order L-204, issued last Saturday by WPB. The order limits manufacture of the sets to decreasing percentages for a 30-day period. For the first 15 days following issuance of the order, production is limited to 4 per cent of total factory sales value of telephone sets manufactured in the calendar year 1941. During the second 15-day period immediately following, production is limited to 2 per cent of the output for the same year. Sets for combat use, for de-

This Week's Priorities and Prices

Steel products distribution to warehouses will be placed under a new system in effect Nov. 1, to make a reasonable tonnage continuously available for emergency purposes. (T-1013)

Mines are given further help in maintaining maximum output of critical mineral with assignment of preference rating AA-2X for delivery of materials for maintenance and repairs by Amendment No. 4 to Order P-56 issued Oct. 13. (T-1008)

National Emergency steel dislocated tonnages are covered by Revised Price Schedule No. 49 which established maximum prices for resale of iron and steel products, according to an interpretation issued by OPA. (OPA-T-197)

Malleable iron castings prices set under maximum price regulation 241, effective Oct. 21. (OPA-941)

Prices at which MRC may buy idle or frozen stocks of tin oxide and tin anodes are established by order 4 under maximum price regulation 204, effective Oct. 15. (OPA-T-187)

Road equipment rental price order widened under maximum price regulation 134, effective Oct. 22. (OPA-T-184)

ODT revises suspension provisions under general order ODT 25, requiring permits for the movement of Great Lakes commercial vessels engaged in domestic transportation, effective Oct. 19. (PM-4030)

■ ■ ■

For copies of above announcements address Office of War Information, Washington, giving announcement number as shown in parentheses after each paragraph. (For example, WPB-600 *means announcement* 600 *issued by the War Production Board.)*

Revisions to The Iron Age Priorities Guide

• • • The following data, together with all intermediate weekly revisions in THE IRON AGE, should be added to THE IRON AGE Priorities Guide published with the issue of October 8 to bring the Guide up to date.

"M" Orders:

M-21-b...Amendment provides for earmarking of warehouse tonnages starting Nov. 1.

M-24...Amended order (10-13-42) requires reports to be filed by 10th day of each month.

M-24-c...Amendment No. 1 (10-13-42) requires segregation of low-phosphorus and low-sulphur stainless steel turnings.

M-30...Amendment 1 (10-16-42) removes exception of holders of A-1-j ratings from restrictions on use and delivery of ethyl alcohol.

M-148...Supplement 2 (10-15-42) provides for completion of export orders covered by BEW licenses issued prior to Oct. 1.

M-154-A...Revoked (10-12-42).

M-219...Amendment No. 1 (10-16-42) provides small order exemption on use and delivery of silica gel.

M-244...(10-16-42) establishes complete allocation system for furnace-type carbon black, effective Nov. 1.

"P" Orders:

P-46...As amended Oct. 10 reduces amount of scarce metal available for public utilities.

P-56...Amendment No. 4 (10-13-42) assigns rating of AA-2X for delivery of materials for maintenance and repairs for mines.

P-107...Amendment 1 assigning preference rating of A-3 to producers of automotive replacement parts is revoked (10-17-42).

P-130...Interprets "equipment of a superseded type" in order as amended Sept. 8 (10-17-42).

P-132...(10-17-42) gives blanket ratings for maintenance, repair and operating supplies and for operating construction of telegraph and cable companies.

"L" Orders:

L-135...Clarification of Interpretation 1 (10-15-42).

L-157...Amendment 2 (10-16-42) to Appendix A of Schedule I makes several changes in sizes and standards of hand tools.

L-190...Restricts production of commercial scales.

L-193...Amended (10-17-42) to extend for 30 days filing of production schedules.

L-203...Places control over small panel electrical combat measuring instruments (10-13-42).

L-204...(10-17-42) stops manufacture of telephone sets in 30 days.

livery to or for the account of the Army, Navy, etc., are excepted.

•

New PD-200b for Construction Projects

Washington

• • • The new form PD-200b must be used after Oct. 26 for all applications for amendments to construction projects authorized by a preference rating order of the P-19 series, the WPB announced on Tuesday.

The form is available at FHA and WPB field offices. It should be used for requests for a higher rating and for items not previously authorized or for increases in quantities previously authorized. When a higher rating is requested the applicant must list the items required and describe the efforts made to obtain these items with the authorized rating.

After Oct. 26, it was emphasized, requests for project amendments will not be accepted on PD-1a forms or by letter, as is the case at present. Letters, however, will continue to be accepted for requests by persons undertaking construction projects for permission to alter delivery dates or for extensions of expiration dates as authorized on the original application.

•

Telegraph Firms Aided

Washington

• • • Blanket ratings for maintenance, repair and operating supplies and for operating construction of telegraph and cable companies were established last Saturday. The new order, P-132, incorporates provisions relating to telegraph and cable companies contained in P-129, as amended July 28, which expired Sept. 30. It expedites the obtaining of materials necessary to maintain and protect the services formerly permitted under P-129, by raising their rating from A-3 and A-1-j to A-1-a.

•

Smelters Are Aided

Washington

• • • A rating of AA-2X for delivery of materials for maintenance and repairs was given to smelters and refiners in an amendment to Order P-73 issued by WPB on Monday. At the same time the rating assigned to operating supplies was raised from A-1-c to A-1-a.

Quotas for materials included in the Metals List of Priorities Regulation No. 11 will be on a pound basis. Quotas for all other materials will be on a dollar basis. Only mines holding serial numbers are entitled to use the preference rating granted.

The Iron Age Critical Tool Locating Chart

• • •

Compiled from latest WPB data on available machine tool capacity.

CRITICAL TOOLS	REGIONAL OFFICES—WAR PRODUCTION BOARD										
	Total	No. 1 Boston	No. 2 New York	No. 3 Philadelphia	No. 4 Atlanta	No. 5 Cleveland	No. 6 Chicago	No. 7 Kansas City	No. 8 Dallas	No. 11 Detroit	No. 12 Minneapolis
BORING											
Horizontal—3" Bar	50,831	7,311	13,290	5,995	.....	10,586	7,773	1,182	751	2,959	984
" —To 4" Bar and Over	51,632	5,457	6,540	8,899	.....	14,042	7,845	3,756	1,705	2,051	1,337
Vertical—54"	33,482	3,813	4,702	4,618	.....	8,190	4,115	3,492	1,388	781	2,363
" —To 84"	46,625	4,121	6,444	8,321	.....	12,698	5,403	3,822	3,173	985	1,658
" —To 120"	16,880	1,733	2,516	2,433	.....	5,211	1,848	1,159	472	696	612
" —Over 120"	6,192	.....	1,392	1,214	.....	1,972	1,053	356	37	.....	168
Jig Borers	28,865	7,793	7,029	2,555	.....	4,591	3,512	715	318	2,239	113
Misc. Precision—Heald—Ex-Cell-O type	18,554	1,756	860	1,329	.....	7,727	4,338	1,520	.....	790	234
BROACHING	65,279	14,958	9,541	4,772	.....	13,121	12,672	3,602	504	4,392	1,717
DRILLING											
Radial 6' to 8' Radius	70,373	6,753	14,473	10,956	.....	19,958	6,847	4,547	3,842	2,128	1,869
Over 8' Radius	6,367	138	3,077	1,186	.....	264	96	432	939	175	60
DUPLICATING AND PROFILING	26,815	10,464	5,008	2,879	.....	3,127	3,354	631	.....	1,214	138
FORGING											
Drop—Hammer—Board 100 lb. up	118,165	37,954	41,986	8,487	.....	17,077	9,777	1,238	642	204	800
Steam 5000 lb. up	8,123	1,291	1,558	431	.....	2,215	583	945	.....	712	388
Press—Forging—Steam Hydr. 500 ton	5,501	856	1,566	72	.....	1,635	950	314	.....	60	48
GEAR CUTTING											
Gear Hobbers—48" and up	19,139	2,464	1,112	2,858	.....	6,116	2,235	1,718	566	1,230	840
Bevel Gear Cutters	47,499	11,857	4,786	7,527	.....	10,118	5,989	1,926	376	4,596	324
GRINDERS											
Centerless	33,953	8,178	4,477	3,313	.....	6,753	4,763	1,763	.....	4,490	216
External Cyl.	378,789	98,932	77,937	35,720	.....	54,063	44,500	25,311	4,686	28,277	11,367
Internal Cyl.	119,967	26,715	17,124	10,347	.....	18,921	15,802	22,650	4,860	9,948	3,600
Thread	4,085	760	1,657	712	.....	604	292	.....	.....	60	.....
LATHES											
Engine—24" Dia.—Over 60" c.-c.	199,816	30,778	35,667	27,978	.....	42,596	22,517	14,282	12,153	5,800	8,045
" —Over 24" Dia.—To 60" c.-c.	83,414	15,651	20,390	8,819	.....	13,346	8,763	9,202	2,108	2,089	3,046
" —Over 24" Dia.—To 96" c.-c.	125,063	17,671	24,896	14,020	.....	27,872	11,589	14,770	7,320	3,095	3,830
" —Over 24" Dia.—Over 96" c.-c.	306,479	46,829	45,534	49,542	.....	61,968	29,484	32,700	23,058	8,736	7,638
Turret —12" Dia. 2½" Bar and up	88,007	13,489	23,524	13,165	.....	17,272	8,891	4,658	2,270	2,724	2,014
" —To 24" Dia. 2½" Bar and up	151,914	20,800	27,965	22,238	.....	30,079	14,872	16,590	5,980	7,846	5,544
" —Over 24" Dia. 2½" Bar and up	35,433	3,320	4,908	6,148	.....	6,206	5,806	4,297	1,572	848	1,328
Automatic—12" Diameter	15,153	2,653	2,148	850	.....	891	5,752	1,074	336	1,220	229
" —To 24" Diameter	13,603	1,678	991	338	.....	1,779	792	982	.....	6,776	289
" —Over 24" Diameter	1,712	.....	192	48	.....	168	1,248	.....	.....	.....	56
SCREW MACHINES											
Automatic—Single 1"	76,169	15,032	30,108	7,959	.....	10,378	8,469	1,846	336	1,505	516
" —Single to 3"	81,816	13,762	18,846	9,302	.....	11,953	11,744	2,898	341	12,594	376
" —Single—Over 3"	14,867	2,537	1,367	1,970	.....	2,013	5,144	168	.....	1,668	.....
" —Mult p'e—To ¾"	6,937	992	2,390	1,112	.....	1,074	336	.....	.....	1,033	.....
" —Multiple—To 1"	86,784	19,488	19,184	6,519	.....	11,087	13,377	4,136	.....	12,513	480
" —Multiple—To 3"	60,755	10,077	9,529	8,381	.....	11,149	10,974	6,295	.....	4,238	112
" —Multiple—Over 3"	4,296	143	108	241	.....	432	3,028	.....	.....	344	.....
MILLING											
Standard Type—Horizontal—No. 3	213,070	44,481	43,597	21,348	.....	39,174	28,715	14,144	5,638	11,515	6,460
" " —Horizontal—Over No. 3	96,474	14,964	20,398	15,488	.....	18,663	9,568	7,082	3,322	4,073	2,366
" " —Vertical—No. 3	39,695	12,188	6,983	2,898	.....	7,018	5,077	1,447	288	3,477	339
" " —Vertical—Over No. 3	42,948	13,645	5,471	6,389	.....	7,749	3,872	1,116	618	3,274	814
Mfg.—Horizontal—12" table width	24,290	9,491	3,983	1,077	.....	2,091	4,530	1,100	120	1,042	856
" —Horizontal—Over 12" table width	13,111	3,115	1,728	348	.....	1,772	4,338	980	120	493	217
Planer—Over 30" table width—slab mill	8,069	1,871	1,570	890	.....	1,786	456	500	.....	256	740
" —Over 30" table width—side spdl.	2,319	359	294	933	.....	113	84	144	128	.....	284
" —Over 30" table width—vert. spdl.	6,583	1,394	1,772	869	.....	1,182	286	.....	148	288	614
" —Over 30" table width—side and vert.	7,783	1,784	617	682	.....	1,852	1,953	192	.....	441	252
Misc. and Dia. Cutting—Heller Type	17,524	5,263	5,106	1,330	.....	4,150	515	316	.....	844	.....
PLANERS											
60" wide to 15'	10,639	1,078	2,010	1,879	.....	2,546	1,667	493	632	278	56
60" wide, over 15'	4,908	1,226	280	836	.....	725	705	540	544	52	.....
Over 60" wide to 15'	3,633	338	410	486	.....	1,591	168	202	37	175	228
Over 60" wide, over 15'	6,589	884	974	1,909	.....	1,755	232	279	.....	276	280
THREADERS											
External Mills	23,777	6,643	2,724	3,353	.....	3,724	3,180	984	16	2,259	914
Internal Mills	5,143	66	1,806	505	.....	1,322	1,260	216	168	.....	.....
TOTAL AVAILABLE HOURS	3,035,639	584,992	595,549	384,290	.....	566,465	372,239	214,672	90,492	169,709	77,235

The available critical tool hours per week here shown are based on an 168-hour week and represent usable tool hours subject to operating labor available. Reports are based on initial inspection of the plants concerned by engineers trained for this work. The War Production Board Field Offices are acting as clearing houses for all public or private contractors or agencies interested in using these facilities.

When making inquiries regarding the availability of these critical tool hours for specific jobs, communicate in detail with the Regional Supervisor, Critical Tools Service, in the WPB Region best located for your job. They are:

Region	*Supervisor*	*Assistant*	*WPB Office*
No. 1 Boston	R. F. Wood	H. H. Whitcomb	17 Court Street
No. 2 New York	J. J. Carroll	C. Philippi	122 E. 42nd Street
No. 3 Philadelphia	C. E. Reinicker	R. V. Hilands	1617 Penn. Blvd.
No. 5 Cleveland	C. J. Perrier	C. R. Griffith	Union Commerce Bldg.
No. 6 Chicago	S. C. Bloom	W. I. Buhl	20 N. Wacker Dr.
No. 7 Kansas City	W. A. Crooks	P. J. Leonard	Mutual Interstate Bldg.
No. 8 Dallas	B. P. Rhineford	W. E. White	4th Fl., Fidelity B'dg.
No. 11 Detroit	R. O. Cunningham	J. B. Shepard	7310 Woodward Avenue
No. 12 Minneapolis	E. H. Pitney		326 Midland Bk. Bldg.

PERSONALS . . .

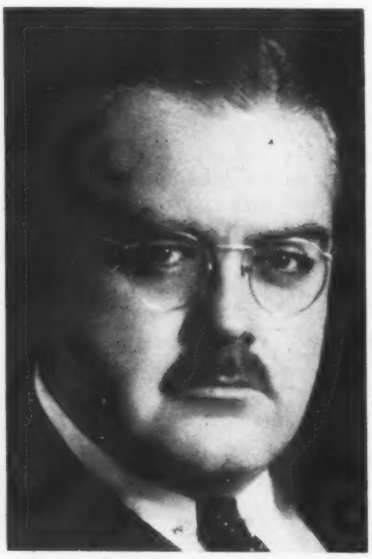
• **Harry F. Boe,** manager of the Westinghouse Electric & Mfg. Co.'s district repair and manufacturing department, has been elected to the rank of vice-president by the board of directors. Mr. Boe began his career with Westinghouse in 1901 as a winder of motor armatures in the shops at the company's East Pittsburgh works. Following seven years' experience in testing electrical equipment, he was transferred to the company's general engineering department and later became a sales engineer in the general industrial division. In 1918 he was appointed industrial salesman at Rochester, N. Y., and in 1922 was named manager of the Buffalo Industrial Division. He was made manager of the Buffalo branch office in 1927. Eight years later he was promoted to manager of the company's eastern district, with headquarters in New York and in 1937 was transferred to Pittsburgh as commercial manager of Westinghouse, and the following year was appointed manager of the company's service department, later reorganized as the district manufacturing and repair department. He received the Westinghouse Order of Merit in March, 1941.

H. V. Putman, manager of the company's transformer division, was elected to the rank of vice-president by the board. Mr. Putman was appointed manager of the Westinghouse Transformer Division, largest transformer plant in the country, in November, 1940. In 1925, he joined Westinghouse as a design engineer on synchronous motors, at the Westinghouse East Pittsburgh works. He was transferred to Sharon as assistant manager of the transformer division's engineering department in 1930 and two years later was promoted to manager of engineering. In April, 1939, he received the Westinghouse Order of Merit for distinguished service.

• **A. W. Herrington,** board chairman of Marmon-Herrington, has been named in Tom Girdler's place on the board of the Aviation Corp., while Mr. Girdler will devote his time, chiefly, to the operation of Consolidated, and Vultee Aircraft, both of which are Aviation Corp. affiliates. He will still be available to the parent corporation, for consultation.

• **J. O. Wetherbie** has been appointed manager of General Electric wiring materials district No. 2, with headquarters at 570 Lexington Ave., New York. This assignment is in addition to Mr. Wetherbie's present responsibility as special representative coordinating the activities of General Electric's appliance and merchandise department and other departments of the company on large governmental, commercial, industrial and residential construction projects.

• **Charles G. Maier,** noted research metallurgist for nearly 20 years associated with the U. S. Bureau of Mines, has been named to the supervisory staff of Battelle Memorial Institute, Columbus, Ohio. He will direct and correlate an enlarged program of fundamental research and will serve as adviser and consultant to the Institute's war research for the government and industry. Before joining the Battelle staff, he was supervising research engineer of the Pacific Experiment Station, U. S. Bureau of Mines, at Berkeley, Cal. Prior to that time he was research fellow and subsequently assistant director of research at the University of Utah. He earlier held industrial positions with the Carborundum Co., Niagara Falls, N. Y., and the Phelps Dodge Corp., New York.



W. J. Sampson, Jr., whose appointment as president of the American Welding & Mfg. Co., Warren, Ohio, was announced in these columns last week.

• **E. R. Lewis** has been named purchasing agent of Accurate Spring Mfg. Co., Chicago, succeeding **C. M. Gabler** who has obtained a leave of absence to join the U. S. Navy.

• **George L. Randall** has been appointed public relations manager of Wickwire Spencer Steel Co., New York. He has been with Wickwire Spencer for the past seven years, recently as advertising manager. In addition to the new assignment, Mr. Randall will continue to be in charge of advertising.

• **Dr. N. E. Woldman,** chief metallurgical engineer, Eclipse Aviation Division, Bendix Aviation Corp., Bendix, N. J., has consented to head the newly organized Aluminum and Magnesium Division of the American Foundrymen's Association. The new division has been organized to study the foundry practices involved in the casting of aluminum and magnesium alloys. Dr. Woldman served on the professional staffs of the Universities of Maine and Illinois. Later he continued his studies at Columbia University, New York, where he received his Doctor of Philosophy degree in chemical and metallurgical engineering. Following this work, Dr. Woldman became professor and head, department of chemistry and metallurgy, U. S. Naval Academy post-graduate school, Annapolis, Md. In 1929, he left that position to enter industry with the Westinghouse Electric & Mfg. Co., Pittsburgh, as research and metallurgical engineer. In 1935 he became senior materials engineer, U. S. Naval Gun factory, Washington, and in 1936 accepted his present position with the Bendix corporation.

• **A. C. Treece,** head of the Chicago sales office of General Electric has been moved to Pittsfield to undertake a special assignment in the manufacturing division. **T. E. Giblin,** assistant manager of sales, has been transferred from headquarters at Pittsfield to the Chicago sales office.

• **A. M. Willett** has been named traffic manager of the Phoenix Iron

Co., Phoenixville, Pa., to succeed **G. O. Hodge** who has resigned his position as traffic manager to accept a major's commission in the Transportation Corps of the United States Army. Mr. Willett was formerly assistant to Mr. Hodge.

• **W. T. Cushing** has been named Detroit branch manager of the Bay State Abrasive Products Co., Westboro, Mass. Mr. Cushing's new affiliation comes after 25 years of sales experience in the grinding wheel business, the greater part of which time was spent in the state of Michigan.

• **V. A. Fox,** chief engineer since 1914, has been elected president and general manager of the Young Brothers Co., Detroit. **C. G. Lisch** has been named vice-president and **C. H. Lisch, Sr.,** has been appointed secretary and treasurer. Other appointments include: **R. B. Reed,** sales manager; **P. A. Meyer,** chief engineer, and **J. A. Tretheway,** shop superintendent.

• **E. T. Knobloch** has been elected president of Union Iron Works, Erie, Pa., and will continue as general manager. **R. E. Sevin,** sales manager, has been named vice-president.

• **A. G. York** has been appointed a member of the valves and fittings committee of the War Production Board, Washington. Mr. York is vice-president in charge of sales of the Watson-Stillman Co., Roselle, N. J.

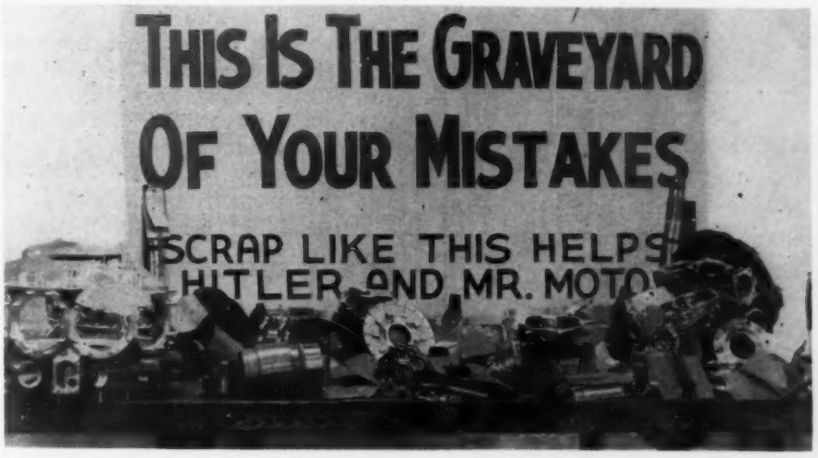
• **Burrell T. Dye,** formerly assistant superintendent of industrial relations for Republic Steel Corp.'s Buffalo plant, has been named superintendent of industrial relations. He succeeds **Martin H. Stearns,** who has resigned. Mr. Dye is succeeded in his former post by **Floyd E. Pilger,** formerly employment manager. **Thomas W. Appleford,** formerly assistant employment manager, has been appointed employment manager.

• **K. R. Van Tassel** has been appointed manager sales of the newly formed integral-horsepower motor section of the General Electric Co.'s Motor Division. **D. A. Yates,** of the same division, had been placed in charge of the Lynn motor group at G-E's Lynn, Mass., plant.

• **J. Frank Roberts,** head hydraulic engineer of the Tennessee Valley Authority, has been named to succeed Dr. William Monroe White as manager of the Allis-Chalmers Manufacturing Co.'s hydraulic turbine department. Dr. White's retirement after 31 years with the firm was announced Thursday night at a dinner honoring him, William Watson, retired vice-president in charge of manufacturing, and Herman Schifflin, retired manager of the crushing, cement and mining machinery department.

MISTAKES: As an effective way of pointing out the cost of unthinking mistakes that cause excessive rejects, E. E. Lehman, salvage manager of the Aviation Corp.'s Lycoming Division, contrived this display. Actual rejects which have been the result of poor workmanship were shown. A series of such displays throughout the shops is contemplated based on the success of this first one.

Courtesy of OWI



OBITUARY . . .

• **Harry J. Sweeney,** chief metallurgist for Republic Steel Corp., and professor in charge of the metallurgical division of the chemistry department at Youngstown College night school, died Oct. 12. He was 38 years old. Mr. Sweeney taught at Carnegie Institute of Technology. Later, he was assistant superintendent of open hearths at the Carnegie-Illinois Steel Corp. in Homestead, Pa. Six years ago he went to Youngstown as chief metallurgist for Republic. In January, 1941, Mr. Sweeney took charge of the metallurgical division of the chemistry department at Youngstown College and taught courses in metallurgy.

• **Robert K. Jeffrey,** vice-president and director of the Jeffrey Mfg. Co., Columbus, died Sept. 29, aged 40 years.

• **Capt. Harry Maynard,** formerly in the government lighthouse service out of Milwaukee and more recently in the engineering department of the Leatham D. Smith Shipbuilding Co., Sturgeon Bay, Wis., died Oct. 15, aged 54 years.

• **George A. Kissel,** pioneer automobile manufacturer and president of Kissel Industries, Inc., Hartford, Wis., died Oct. 15. In 1905 he, with his father and three brothers, organized the Kissel Motor Car Co. at Hartford to manufacture the Kissel Kar, distinguished by its modern design, and having some 1400 employees. In 1930 the automobile firm was reorganized to become Kissel Industries, Inc.

• **John Ringle, Jr.,** president of the Northern Chief Iron Co., Wausau, Wis., died recently at Glendale, Cal. Mr. Ringle was also secretary-treasurer of the Ringle Brick Co., Wausau.

• **Daniel A. Murray,** until recently controller at the A. O. Smith Corp., Milwaukee, died Oct. 10. He was 49 years old.

• **Ray F. McNamara,** one of the pioneer automotive engineers, died Oct. 15 at Syracuse. He was a parts engineer for Chrysler Corp. at the time of his death. He was identified with automotive engineering in Detroit from the very early days of the industry, and was noted for long distance test runs made decades ago.

NON-FERROUS METALS

. . . Market Activities and Price Trends

Government Considering Lead For Anti-Corrosion Coatings

• • • **The use of lead** as an anti-corrosion coating for steel is said to be under study by procurement agencies of the government, who are considering it for some specifications in place of zinc galvanizing. While zinc is not desperately short, production and consumption are about equal and there is little stockpile growth. The lead stockpile, on the other hand, is thought to contain well over a year's military requirements of the metal, and is continuing to grow at an unchanged rate. Lead coatings can be applied by either hot dip or electroplating, with the same equipment that is used for zinc. No one holding an effective steel priority would have difficulty in getting lead for coating. Among the disadvantages of lead coating is the fact that lead is lower than iron in the electrochemical series and so does not retard corrosion of exposed iron spots.

On Monday the St. Joseph Lead Co. reduced the premium on chemical lead $1 a ton, to make it more attractive as a substitute for ordinary lead. The new price will be 6.40c. per lb. at St. Louis, 6.45c. Chicago, 6.55c. New York and 6.60c. New England. The premium had been $2 a ton.

The NLRB last week granted an increase of $1 a day to 10,000 copper, lead and zinc workers in Idaho and Utah, half of the increase to be paid only to workers whose production comes up to certain standards. Retroactive pay, to May 15 for Idaho miners and to July 1 for Utah miners, is to be paid in war bonds and stamps.

The first requisitioning order under the WPB's copper recovery program was served Oct. 9 on the Sunshine Mantle Co., Chanute, Kan. Approximately 140,000 pounds of copper products were seized by the government for use in war industries. The company had refused to sell its copper inventories to the government, although it was prohibited from making use of them by WPB orders restricting this scarce material to essential uses.

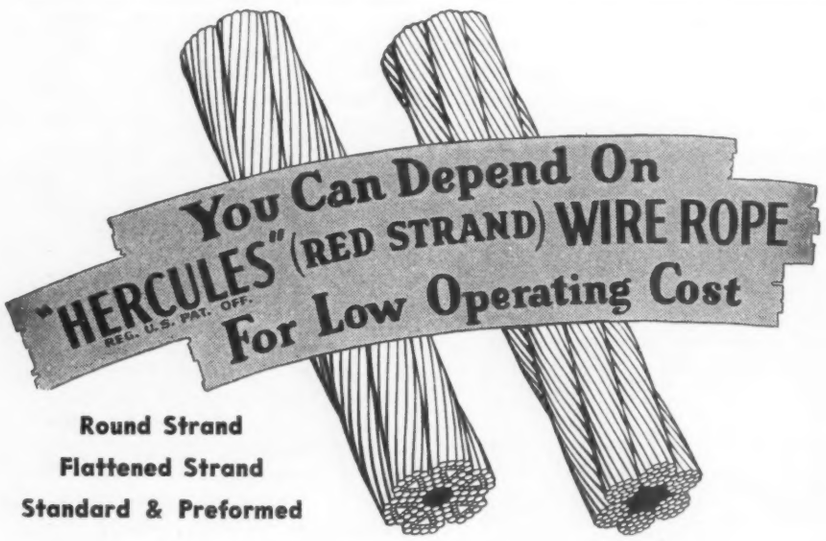
A nation-wide round-up of copper was undertaken last July by the Copper Recovery Corp., acting on behalf of WPB. More than 30,000,000 lb. have been acquired for the war effort as the result of voluntary sales by owners. Government prices for fabricated copper products which must be remelted before re-use run as much as two and one-half times their value as scrap.

WPB's amusement section has arranged to salvage copper drippings and strippings (thousands of pounds, it hopes) from the butt of carbons used in motion picture projectors. Last year 52,000,000 carbons, bearing 273,000 lb. of copper were used. It is expected that approximately 90 per cent of this can be salvaged.

Eighty-eight per cent of South Dakota's mineral production is wiped out with closing of the gold mines, terminating the most prosperous period in the history of Black Hills gold mining. . . . Senator McCarran (Nev.) will oppose legislation to sell non-monetary silver to private industry.

Chilean Says Axis Gets Bolivian Tin

• • • According to a Santiago, Chile, dispatch to the *CIO News*, Bolivian tin is being shipped to the Axis. The dispatch says that according to Salvador Ocampo, member of the Congressional Committee investigating Fascist activities, the Chilean merchant ship *Alfonso* recently left the Chilean port Talcahuano with 600 tons of tin bound for Axis use, and further says that the shipping agents involved regularly engage in such traffic in tin, and diesel oil. It has been known that Bolivian shipments to the United Nations are less than was hoped for, but no previous mention has been made of Axis shipments of tin from that country.



Round Strand
Flattened Strand
Standard & Preformed

WHY not let "HERCULES" (Red-Strand) Wire Rope help you meet present day production requirements and still maintain a reasonable margin of profit? You will quickly discover that "HERCULES" is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production.

Made Only By **A. LESCHEN & SONS ROPE CO.** Established 1857
5909 Kennerly Avenue, St. Louis, Mo.
New York • Chicago • Denver • San Francisco • Seattle • Portland

OPA in Midwest Ends Survey Of Second-Hand Machinery

Cleveland

• • • **The Machinery Branch** of OPA has completed a survey of second-hand machinery and parts available for sale in Ohio, Kentucky, West Virginia, Indiana, and Michigan, Larry Maringer, chief of the branch reported. The machinery specialist staff of the Cincinnati, Detroit, and Cleveland offices has been engaged in the regional survey for about two months.

Since it has been necessary for the WPB to limit the production of most new machinery, there has been an active demand for various types of second-hand units with a corresponding increase in prices. It was discovered in a number of cases that the price of the second-hand machines had exceeded the price of the machine when new. Consequently, the branch is concerned with setting ceiling prices on second-hand machinery and parts, and is also interested in keeping an inventory of such equipment.

Maximum prices on second-hand machinery and parts have been established by Regulation 136, effective July 22, 1942, as 85 per cent of the price of an equivalent new machine based on Oct. 1, 1941, prices where the used units have been rebuilt and 55 per cent of the price of an equivalent new unit as of Oct. 1, 1941, in all other cases.

•

General Motors Arranging $1 Billion V-Loan Bank Credit

• • • **General Motors** is completing arrangements for a $1,000,000,000 revolving war credit to help speed the nation's war production program, it was announced Oct. 17 by Alfred P. Sloan, Jr., chairman.

Requiring much larger working capital funds to carry inventories and receivables far in excess of normal levels, General Motors is arranging credit facilities under a bank loan agreement in accordance with the provisions of Executive Order No. 9112 and the ensuing Regulation V of the Federal Reserve System, the stated objective of which is "to facilitate and expedite production for war purposes." This has been done through the cooperation of the War Department and the Federal Reserve Bank of New York. It is anticipated that approximately 400 banks throughout the country, with which General Motors and General Motors Acceptance Corp. have been carrying accounts, will extend credit under the agreement, which will run until Feb. 28, 1946.

•

Welding Expert Discusses Cleaning of Aluminum

• • • **Belief that motor-driven** wire brushing is the best means of cleaning aluminum preparatory to resistance welding was expressed by J. H. Cooper, of Taylor Winfield Corp., Warren, Ohio, before the October meeting of the Detroit Section of the American Welding Society.

Mr. Cooper said that cleaning, representing 90 per cent of the problem of preparing aluminum, was a means of equalizing resistance by lowering it throughout the area to be welded. He said the quality of the cleaning could be measured by resistance testing, as in a Kelvin bridge setup.

Leon C. Bibber, welding engineer of Carnegie-Illinois Co., Pittsburgh, described plate preparation for arc welding. Listing "U" and "J" joint designs for mild steel welding, he stated there was no reason why welding shops should not be rigged to be able to produce such types. Machined joints, he stated, are not necessarily expensive, for torch cutting of such types is apt to require increased use of weld metal.

In lap joints, he stated, the worst problem faced in plate preparation is moisture. He said the common experience in shipyards was that if the surfaces are wet, steam is created, developing blowholes in the weld. Capillary action, he pointed out, holds moisture on the plate even after apparently thorough cleaning. He said that paint frying in lap welding of mild plate caused some porosity, but was not harmful if the weld was sufficiently strong.

The technical chairman was Earl H. Foss of Murray Corp. Prior to the speaking program, the gathering saw two in the series of full color motion pictures on welding, produced by General Electric.

TOLERANCE-
a vital figure in
spring performance
It pays to analyze your spring tolerance requirements in the light of exact needs. You'll help your springmaker and yourself by being specific. If your spring design is tough — requiring close tolerances, Dunbar's is the place to get them. If, on the other hand, tolerances are easy, and mass production your desire — Dunbar's also is the place to go.
The spring you need is the spring that does the work—no more, no less. Let your springmaker help you to get it. Let your springmaker be
Dunbar Bros. Co.
DIVISION OF ASSOCIATED SPRING CORPORATION
BRISTOL, CONNECTICUT
"Quality Springs Since 1845"

SCRAP

. . . Market Activities and Quotation Trends

High Ingot Output Seen as Reflection Of Gains in Scrap

• • • **National steel production** at an all-time high mark testifies to the strength of the scrap picture, greatly aided by the household salvage campaign and the new industrial scrap drive.

Thousands of volunteer executives were calling upon plants of the nation this week, lining up new sources of scrap. The tonnages involved are expected to be even greater than in home salvage. Stimulation of the flow of industrial material, topping the highly successful newspaper drive for household salvage, will send the steel industry into the winter with a far greater backlog of scrap than seemed possible a few months ago.

The newspaper campaign (praised this week by Donald M. Nelson as a "magnificent and unprecedented" job) closed with claims of some 3,000,000 tons collected. Actually, the total is believed considerably lower but still above expectations. The final tonnage figure is complicated by the fact that cubic foot capacity was used in some areas as a basis of measurement, while in other areas net tons were employed and in still other districts receipts for tonnages previously sold were included. New York claimed around 130,000 tons but the actual amount was somewhere around 35,000 tons.

Other items of interest in the scrap picture during the past week may be summarized as follows:

Reports required under the iron and steel scrap order, M-24, must now be filed by the 10th of the month, instead of the 15th. Segregation of low phos and low sulphur stainless turnings is required under an amendment to M-24-c.

During September, the scrap producer emblem was awarded by WPB to 138 scrap dealers and 756 auto graveyards for outstanding work in moving scrap.

There are now 13,000 local salvage committees throughout the country directing activities to obtain scrap materials of all kinds.

An amendment to Order M-72-a effective Oct. 20 requires more than 400 municipalities to enlist their regular trash collection machinery in a systematic and continuing collection and segregation of scrap tin cans.

•

New System Employed in Sorting Alloy Steel Scrap

Buffalo

• • • **A new method** of sorting scrap alloy steel to expedite reclamation work has been developed by W. R. Gordon, a plant engineer at the J. H. Williams Co., makers of drop forgings. The innovation simplifies the complicated 18-classification system for alloy steel scrap outlined by the WPB, so that practically everything can be included in five "families" of alloys.

A combination of letters of the alphabet and the standard steel listing numbers are used in identifying and sorting the scrap alloy. The letters are cut into each forging die. When the excess metal is trimmed, workmen can identify each piece of scrap.

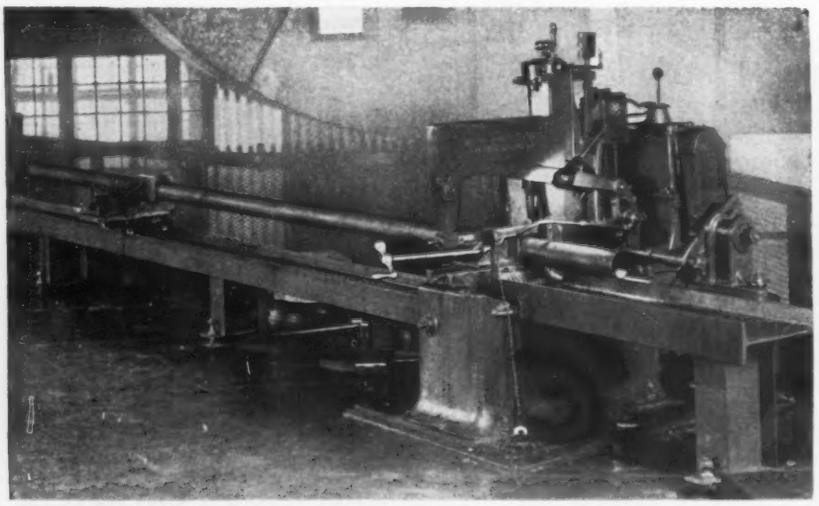
•

WMI to Engage and Pay For Demolition of Structures

Washington

• • • **In its restricted role** as a financial agent, War Materials, Inc., will engage and pay contractors for the demolition of structures. This will be WMI's working relationship with the WPB Conservation Division's Special Salvage Section, as announced by the Salvage Section last Friday. Projects will be located and investigated by the field force of the Section, which will advise the owner regarding the transfer of title to WMI.

The Salvage Section said that since March, it has arranged for the movement of 1,800,000 tons of iron and steel scrap, mostly without financial assistance, except in the case of street car rails handled by WPA. WPA, it was added, is continuing to handle projects of this type, but where it does not have labor available WMI will "take care of the demolition."



cut-off metal the economical way

The most economical method of cutting-off identical pieces from bar steel is with a MARVEL Automatic Production Saw. It will give you more pieces per hour, per machine and per dollar cost than any other accurate cutting-off method. Figured in cost per piece, it will have the lowest labor cost too, because MARVEL Automatic Saws operate with no more attention than an automatic screw machine. They keep chip loss down to a minimum and on many jobs will give you extra pieces per bar.

For cast automatic production or for single-cut miscellaneous work, MARVEL 6A or 9A Hack Saws are fast, accurate tools. Capacities 6" x 6" or 10" x 10", single or nested bars. Write today for Bulletin N. 600.

MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave.
Chicago, U.S.A.

Eastern Sales Office:
225 Lafayette St., New York

Drive Starts for Industrial Scrap

• • • **One thousand** sales engineers, all full-time employees of the firms in the American Steel Warehouse Association, launched this week an all-out search for dormant scrap metal in 20,000 industrial plants in every section of the United States. The salesmen are from 19 chapters of the Association and are under the leadership of J. J. Hill, Jr., of Hill-Chase and Co., steel warehouse firm in Philadelphia.

Dormant scrap is described as obsolete, idle or unused machinery, structures and fixtures, discarded tools and worn-out or broken parts, all of which is excellent for melting.

A substantial stock of dormant scrap still exists despite recent scrap campaigns, Chairman Hill said.

"One Philadelphia plant, reported 'as clean as a whistle,' yielded 17 tons when shown dies of an old-time vehicle which had not been used for 11 years," he continued.

The warehousemen have set themselves a goal of 2,000,000 tons of dormant scrap metal. Associated with the chairman in the scrap drive are: J. Frederick Rogers, of Buffalo; L. R. Moise, of Milwaukee; and C. E. S. Dickerson, of Pittsburgh.

•

PITTSBURGH—The flow to some mills here is responsible for better operating rates but at one or two locations day-to-day operations continue to be supported by allocations. Some of the recently collected metal has found its way to this area's open hearths although this is not general. Some yards continue to have difficulty in obtaining sufficient labor. Present collections have not changed the opinion of some who expect much different conditions this winter owing to adverse weather and possible change in the rate of enthusiasm as well as the availability of scrap.

•

CLEVELAND—More than 100 trucks made a house-to-house scrap drive here Sunday, collecting 40,000 tons of scrap metal. There are still remaining to be collected another 10,000 tons.

•

PHILADELPHIA—Shipments are reported about the same as last week in this area which is a slight improvement over the same period a month ago. Most mills report a temporarily satisfactory flow but point out that no backlog is possible. The slight increase is attributed mainly to the results of the local scrap campaigns. Most steel operators look upon the results of civic scrap drives here with amazement and are somewhat cheered by the fact that scrap yards will in many cases require 3 to 4 months to move the present piles to the mills.

•

ST. LOUIS—The scrap campaign continues to bring out heavy tonnages. Eighty Missouri counties report 57,700 tons to Oct. 17. Mills working on highly essential war materials are being well served with scrap and are adding to inventories. Other plants, however, are complaining of scarcity. One mill is cutting into reserves at the rate of 1000 tons per week and has only two weeks reserve.

•

CHICAGO—The picture here is a little brighter, but mill buyers are still keeping their fingers crossed, fearing that the present fillip in the scrap movement may be only of a temporary nature. However, if it can hold up for another two or three months, several new blast furnaces will be in operation by then and will relieve the situation substantially. The labor problem in scrap dealers' yards is growing more critical and will require drastic action if the huge tonnages of public scrap are to flow through the yards without interruption.

•

TORONTO—Despite the heavy outpouring of scrap, the government is calling for still greater volume. A more concentrated effort is planned in Ontario in November. It is stated that under the new plan scrap will be purchased from holders, not dealers or producing plants, at $7 per ton for small lots and $8.50 a ton for lots over 25 tons. This program already is in effect in Western Canada, and G. C. Bateman, metals controller, stated that more than 150,000 tons already have been gathered.

•

DETROIT—The aid of 150 iron and steel experts was enlisted by the Detroit WPB office to call on 2500 industrial plants in Michigan to urge cooperation in moving dormant scrap. The main chairman of the various committees were: E. L. Wetstein and P. T. Farrell of Great Lakes Steel Corp.; E. W. Lynch of Union Drawn Steel Co., and P. W. Mills of Great Lakes Thread Co.

•

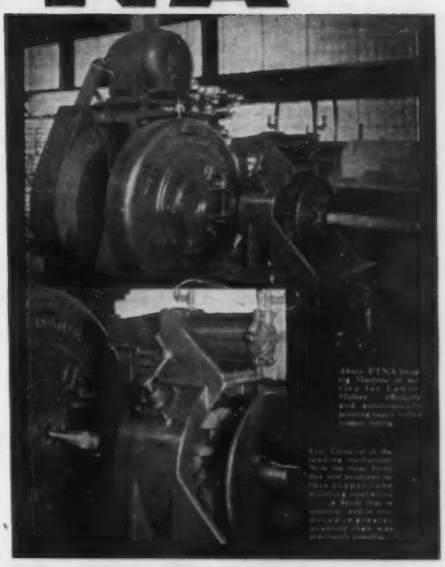
CINCINNATI—Dealers in the Southern Ohio District are somewhat dazed over the sudden stoppage of the work done by War Materials, Inc. Recent scrap drives are creating serious problems in the preparation, grading and using of the miscellaneous material. On the other hand, dealers are pleased over the response to these drives, particularly from the commercial and industrial sources. Scrap is flowing at a better rate and nobody lacks material now.

•

BIRMINGHAM—Little of the scrap collected in the newspaper campaign has been sorted and prepared here, but mills are beginning to feel beneficial effects from the drive. More than 25,000,000 lb. of material have been collected in this city and county.

LEWIN-MATHES *Got the right answer at*

ETNA



They had a job of pointing heavy-walled copper tubing, and wanted to speed up the operation. Just how to do it didn't appear on the horizon, and so Lewin-Mathes did the safe and logical thing—they put their swaging job up to Etna.

The answer to that problem is illustrated on this page. It's a modern Etna Swaging Machine that points *more* copper tubes per hour in less time at less cost. If you have a problem involving tapering or reducing tubing and solid rounds—ask Etna about it.

Etna has the swaging machines from ⅜" to 4" and the experience to help you get the most out of this type of machine.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING... "Ask ETNA About Swaging"

ETNA MACHINE COMPANY
TOLEDO ○ OHIO

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES (No. 1 Heavy Melting; No. 1 Hydr. Compressed Black Sheets; No. 2 Heavy Melting; Dealers' No. 1 Bundles; Dealers' No. 2 Bundles; No. 1 Busheling)	Unbaled* Machine Shop Turnings	BLAST FURNACE GRADES (Mixed Borings and Turnings; Shovelling Turnings; No. 2 Busheling; Cast Iron Borings)	ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES											
				Low Phos.			Heavy Structural and Plate			Cut Auto. Steel Scrap					
				No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	3 ft. and Under	2 ft. and Under	1 ft. and Under and Auto, Springs, and Crankshafts	Alloy free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$16.00	$16.00	$17.50	$25.00	$22.50	$21.00	$21.50	$22.00	$20.00	$20.50	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	15.50	15.50	17.00	24.50	22.00	20.50	21.00	21.50	19.50	20.00	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Pt.	18.75	14.75	14.75	16.25	23.75	21.25	19.75	20.25	20.75	18.75	19.25	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	15.50	15.50	17.00	24.50	22.00	20.50	21.00	21.50	19.50	20.00	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	15.25	15.25	16.75	24.25	21.75	20.25	20.75	21.25	19.25	19.75	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	14.25	14.25	15.75	23.25	20.75	19.25	19.75	20.25	18.25	18.75	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	14.00	14.00	15.50	23.00	20.50	19.00	19.50	20.00	18.00	18.50	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	13.85	13.85	15.35	22.85	20.35	18.85	19.35	19.85	17.85	18.35	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	13.85	13.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	13.50	13.50	15.00	22.50	20.00	18.50	19.00	19.50	17.50	18.00	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	13.00	13.00	14.50	22.00	19.50	18.00	18.50	19.00	17.00	17.50	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	12.50	12.50	14.00	21.50	19.00	17.50	18.00	18.50	16.50	17.00	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	10.50	10.50	12.00	19.50	17.00	15.50	16.00	16.50	14.50	15.00	15.50	12.50	14.00	15.50

*Baled turnings are $4 per gross ton higher. Dealers may charge $2 per ton for crushing other than heavy turnings. An industrial producer may charge $1.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshoho ken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c.. *At Cincinnati, for basic open hearth grades, cut auto scrap and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport. Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakland, Cal.

MAXIMUM pri es of inferior grades shall continue to bear same differential below corresponding grades as existed during the period Sept. 1, 1940, to Jan. 31, 1941. Superior grades cannot be sold at a premium without approval of OPA. Special preparation charges in excess of the above prices are banned. Whenever any electric furnace or foundry grades are purchased for open hearth or blast furnace use, prices may not exceed the prices above for the corresponding open hearth grades.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad car or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. Dock charge is 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

AT NEW YORK city or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $2.50 (and in the case of the material from whi h No. 1, No. 2, and No. 3 bundles are made $4) less the maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared s rap is provided.

Maximum price of all scrap in a vehicle is that of the lowest price grade in the shipment. This limitation does not apply to vessel shipments if grades are segregated.

Where scrap is to undergo preparation prior to its arrival at the point of delivery, such scrap is not at its shipping point, as that phrase is defined above, until after preparation has been completed. For special preparation charges, consult official order.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

UNPREPARED CAST IRON SCRAP—Except for heavy breakable cast, unprepared scrap is given a price ceiling of $2.50 per ton less than the maximum prices for the corresponding grade of prepared cast iron scrap. Where scrap is to undergo preparation prior to arrival at the point of delivery, such scrap is not considered at shipping point until preparation is completed.

Consumers of cast scrap may pay the shipping point price plus established charge for transporting the scrap to their plants. In the case of deliveries by truck, the cast scrap buyer must obtain from the seller a certification, made out to OPA.

*At Memphis 50c.; Great Lakes ports $1; New England $1.25.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails: 3 ft. and Under	Scrap Rails: 2 ft. and Under	Scrap Rails: 18 in. and Under
Cleveland, Cincinnati, Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.50	24.00	24.25	24.50
Chicago, Philadelphia, Sparrows Pt., Wilmington, Birmingham, Los Angeles, San Francisco	19.75	20.75	22.25	22.75	23.00	23.25
Buffalo	18.00	19.00	20.50	21.00	21.25	21.50
Detroit	20.25	21.25	22.75	23.25	23.50	23.75
Duluth	18.85	19.85	21.35	21.85	22.10	22.35
Kansas City, Mo.	19.00	20.00	21.50	22.00	22.25	22.50
Kokomo, Ind.	17.00	18.00	19.50	20.00	20.25	20.50
Seattle	19.25	20.25	21.75	22.25	22.50	22.75
St. Louis	15.50	16.50	18.00	18.50	18.75	19.00
	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast	$18.00	$19.00	$20.00
No. 1 machinery cast, drop broken, 150 lbs. and under	18.00	19.00	20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	17.50	18.50	19.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	15.50	16.50	17.50
Charging box size cast	17.00	18.00	19.00
Misc. Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas Oklahoma, Texas and Florida.

Group C: States not named in A and B; switch district of Kansas City, Kan., Mo.

. . . Composite Prices

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. (Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Oct. 20, 1942	Oct. 13, 1942	Sept. 22, 1942	Oct. 21, 1941
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Oct. 20, 1942	Oct. 13, 1942	Sept. 22, 1942	Oct. 21, 1941
No. 2 fdy., Philadelphia	$25.89	$25.89	$25.89	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	24.68	24.68	24.68	24.06
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.39	25.39	25.39	25.34
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	31.34
Ferromanganese‡	135.00	135.00	135.00	120.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melting steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	23.00
No. 1 cast, Pittsburgh	20.00	20.00	20.00	22.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	24.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$6.00	$6.00	$6.00	$6.125
Foundry coke, prompt	6.875	6.875	6.875	6.875
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	5.70
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 150 to 158 herein.

. . . Comparison of Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Oct. 20, 1942	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1942	2.30467c.,	2.30467c.,	$23.61	$23.61	$19.17	$19.17
1941	2.30467c.,	2.30467c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99629c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

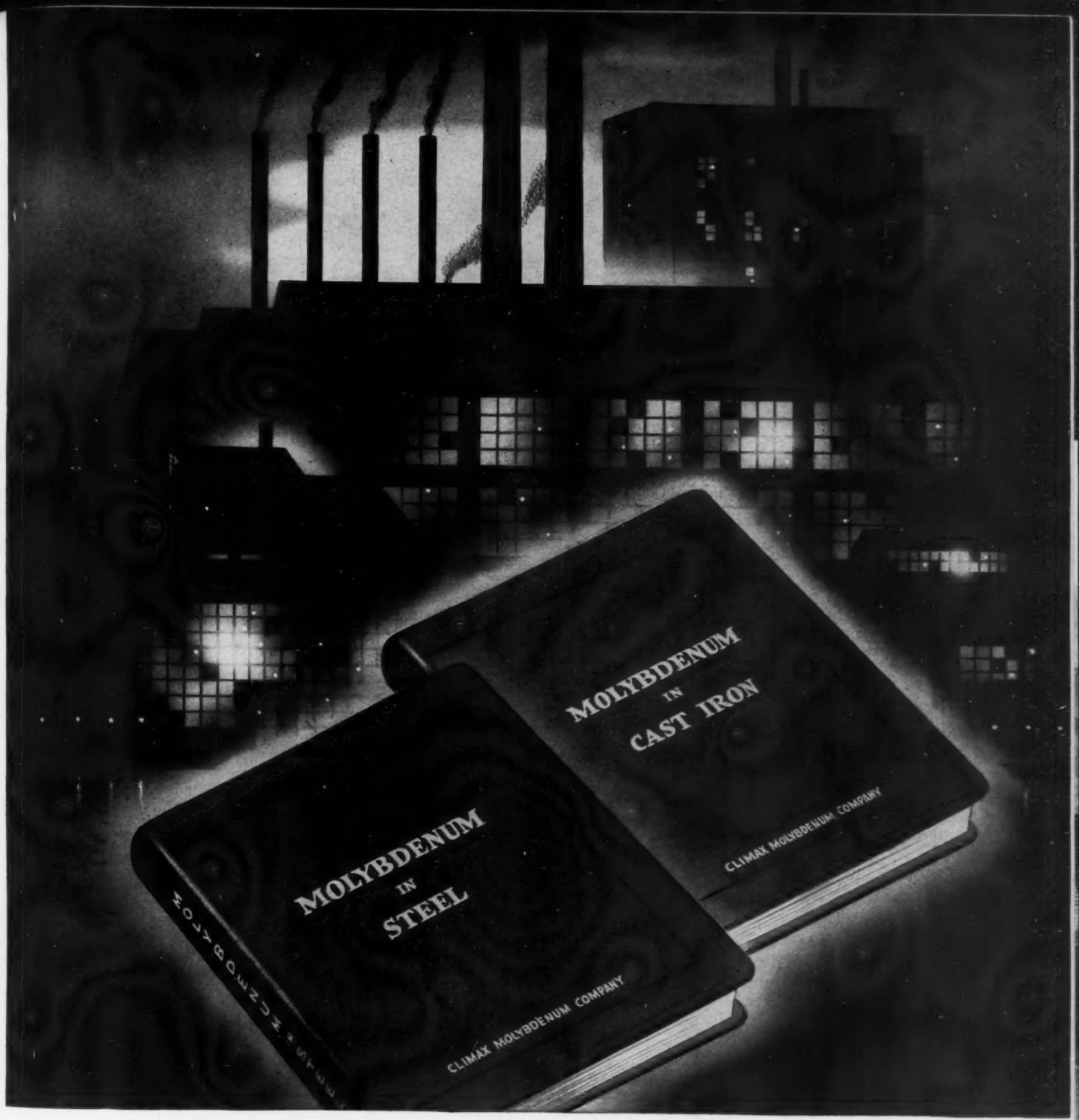
Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.22¢	2.35¢	2.28¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.17¢	3.41¢	3.39¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.75¢	3.68¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.47¢	3.73¢	3.69¢
Long ternes[2]	3.80¢		3.80¢									4.55¢		4.18¢	4.14¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.22¢	2.48¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.92¢	3.18¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.58¢	
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.07¢	3.33¢	
TIN PLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.38¢	5.34¢
BLACK PLATE															
29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ [12]			3.39¢
TERNES, M'FG															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.52¢	2.80¢	2.27¢	2.51¢	2.49¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.52¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.52¢	2.55¢ [14]	2.27¢	2.40¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.52¢	2.55¢ [14]	2.27¢		2.49¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢					3.01¢	2.99¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massilon, Canton = 2.70¢)					2.82¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.47¢		
PLATES								(Coatesville and Claymont = 2.10¢)							
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.25¢ [11]		2.47¢	2.65¢	2.33¢	2.30¢	2.155¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.72¢	4.00¢		3.73¢	3.69¢
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.97¢	4.15¢		3.71¢	3.60¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.47¢	2.75¢		2.28¢	2.22¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright[15]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)					3.10¢			2.94¢
Galvanized	add proper size extra and galvanized extra to bright wire base, above.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.54¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.74¢
IRON BARS[12]															
Wrought single refined	4.40¢														
Wrought double refined	5.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lot to manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [11] Ship plates only. [12] Common iron bars quoted at 2.15c. by Terre Haute, Ind., producer. [13] Boxed. [14] Portland and Seattle price, San Francisco price is 2.50c. [15] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

GOVERNMENT CEILINGS—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices, which are on another page of this issue.

EXCEPTIONS TO PRICE SCHEDULE NO. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote 2.35c. at established basing points; Calumet Steel division of Borg Warner may quote 2.35c., Chicago, on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.33c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote for shipment to Detroit area on Middletown base. On galvanized sheets, Andrews Steel may quote 3.75c. at established basing points. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote 2.30c. established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. SEMIFINISHED STEEL—Follansbee Steel Corp. may sell forging billets at $49.50 f.o.b. Toronto; Continental Steel Corp. may sell Acme Steel Co. at $34 for rerolling billets plus extras and freight; Ford Motor Co. may sell rerolling billets at $34 f.o.b. Dearborn; Andrews Steel Co. may sell forging billets at $50 at established basing points and slabs at $41; Empire Sheet and Tin Plate may sell slabs at $41 at established basing points and sheet bars at $39 f.o.b. mill; on lend-lease sales Northwestern Steel & Wire Co. may charge $41 per gross ton f.o.b. mill for rerolling billets; on lend-lease sales Wheeling Steel Corp. may charge $36 per ton for small billets, f.o.b. Portsmouth and $37 per ton for sheet bars f.o.b. Portsmouth; Laclede Steel Co. on semifinished sales for lend-lease shipped to eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. ALLOY STEEL BARS—Texas Steel Co. may use Chicago base f.o.b. Worth Worth.



PRACTICAL DATA FOR PRESENT PROBLEMS

Here are two books designed to help users of Molybdenum steels and irons to conserve all alloying elements, and possibly steel and iron, by getting the most in the way of strength, toughness and wear resistance with the lowest alloy content.

"MOLYBDENUM IN STEEL" covers the fundamental metallurgy of Molybdenum steels. Heat treatment – physical properties – applications – of a number of these steels are treated at length.

"MOLYBDENUM IN CAST IRON" covers the effect of Molybdenum in gray iron, giving suggested analyses for practical applications and detailed discussion of high strength (60,000 p.s.i. and up) irons.

Both books will gladly be sent free on request.

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.25 higher; f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.25 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Alloy Steel Blooms, Billets and Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton $54.00

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per Lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi, 3c. higher.

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hotstrip	17.00c.	17.50c.	24.00c.	35.00c.
Cold st.	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston††	*$25.53*	*$25.03*	*$26.53*	*$26.03*	.....	.....
Brooklyn	*27.65*	.....	.....	*28.15*	.....	.....
Jersey City	*26.62*	*26.12*	*27.62*	*27.12*	.....	.....
Philadelphia	*25.89*	*25.39*	*26.89*	*26.39*	.....	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....	.....
Everett, Mass.††	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	$29.50	.....
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa.*	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati	*24.68*	*24.68*	.....	*25.18*	.....	.....
Canton, Ohio	*25.47*	*24.97*	*25.97*	*25.47*	.....	.....
Mansfield, Ohio	*26.06*	*25.56*	*26.56*	*26.06*	.....	.....
St. Louis	*24.50*	*24.00*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	.....	*$31.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	.....	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown*	24.00	23.50	24.50	24.00	.....	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	$28.00
Lyles, Tenn. fc.†	.....	.....	.....	.....	.....	33.00
St. Paul	*26.76*	.....	*27.26*	*26.76*	.....	.....
Duluth	24.50	.....	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*27.25*	.....	.....	.....	.....	.....
San Francisco	*27.25*	.....	.....	.....	.....	.....
Seattle	*27.25*	.....	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

*Pittsburgh Coke & Iron Co. (Sharpsville, Pa. furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

**Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

†Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

††Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $1 per gross ton above maximum prices.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade (1.75 per cent to 2.25 per cent).

Phosphorous Differential: Basing point prices are subject to a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over.

Manganese Differentials: Basing point prices are subject to an additional charge not to exceed 50c. a ton for each 0.50 per cent manganese content in excess of 1.00 per cent.

NATIONAL EMERGENCY STEELS (Hot Rolled)

Extras for Alloy Content

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT									Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Nickel	Chromium	Molybdenum	Vanadium	Bars & Bar-Strip	Billets, Blooms, & Slabs	Bars & Bar-Strip	Billets, Blooms, & Slabs
NE 8024	.22/.28	1.00/1.30	.040	.040	.20/.35	.....	.....	.10/.20	.....	.45c	$ 9.00	.95c	$19.00
NE 8124	.22/.28	1.30/1.60	.040	.040	.20/.35	.....	.....	.25/.35	.....	.85	17.00	1.35	27.00
NE 8233	.30/.36	1.30/1.60	.040	.040	.20/.35	.....	.....	.10/.20	.....	.65	13.00	1.15	23.00
NE 8245	.42/.49	1.30/1.60	.040	.040	.20/.35	.....	.....	.10/.20	.....	.65	13.00	1.15	23.00
NE 8339	.35/.42	1.30/1.60	.040	.040	.20/.35	.....	.....	.20/.30	.....	.75	15.00	1.25	25.00
NE 8442	.38/.45	1.30/1.60	.040	.040	.20/.35	.....	.....	.30/.40	.....	.90	18.00	1.40	28.00
NE 8447	.43/.50	1.30/1.60	.040	.040	.20/.35	.....	.....	.30/.40	.....	.90	18.00	1.40	28.00
NE 8547	.43/.50	1.30/1.60	.040	.040	.20/.35	.....	.....	.40/.60	.....	1.25	25.00	1.75	35.00
NE 8620	.18/.23	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.15/.25	.....	.75	15.00	1.25	25.00
NE 8630	.27/.33	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.15/.25	.....	.75	15.00	1.25	25.00
NE 8724	.22/.28	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8739	.35/.42	.75/1.00	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8744	.40/.47	.75/1.00	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8749	.45/.52	.75/1.00	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8817	.15/.20	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.30/.40	.....	.90	18.00	1.40	28.00
NE 8949	.45/.52	1.00/1.30	.040	.040	.20/.35	.40/.60	.40/.60	.30/.40	.....	1.20	24.00	1.70	34.00

Note: The extras shown above are in addition to a base price of 2.70c per 100 lb., on finished products and $54. per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished.

FINE TOOL STEELS FROM A FAMOUS TOOLMAKER

Disston has been making high grade tools for more than a century. Henry Disston, to meet his own exacting requirements, melted the first crucible saw steel made in America, in 1855. It was at the Disston plant in 1906 that this country's first commercial electric saw steel was produced.

Disston continues to manufacture steel for its tools today—steels which must measure up to the standards of a toolmaker with a world-wide reputation for quality. That is why in the Disston steel plant you find modern electric furnaces; highly skilled personnel; the most expert and accurate metallurgical and chemical supervision.

It is possible with selected materials, precise controls, special equipment and experienced craftsmen to produce Disston Tool Steels with highly desirable characteristics — to precise specifications.

Selecting the best tool steel for the job:

Disston engineers and metallurgists will, without obligation, help you determine the right tool steels for better performance and longer tool life . . .

If you have not received your *free* copy of the illustrated 73-page book, "Disston Tool Steels," write today to Henry Disston & Sons, Inc., 1019 Tacony, Philadelphia, Pa., U.S.A.

DISSTON CONSERVATION CONTROL CARDS . . .

Send now for these cards which contain valuable information on the selection, working and application of six different types of tool steels. The cards are supplied *without charge*, as a feature of the Disston Conservation Control Plan to save essential tools and materials.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, per Package of 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent off List

Machine and Carriage Bolts:

½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose 71 and 10

Stove bolts in packages, with nuts attached 71

Stove bolts in bulk 80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets *(½ in. and larger)*

Base per 100 lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham $3.75

Small Rivets *(7/16 in. and smaller)*

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham 65 and 5

Cap and Set Screws *Per Cent Off List*

Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Filister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)

Base Price—$200 per Net Ton

Steel (Butt Weld)

	Black	Galv.
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½

Wrought Iron (Butt Weld)

½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Steel (Lap Weld)

2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½

Wrought Iron (Lap Weld)

2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17

Steel (Butt, extra strong, plain ends)

	Black	Galv.
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57

Wrought Iron (Same as Above)

½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Steel (Lap, extra strong, plain ends)

2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56

Wrought Iron (Same as Above)

2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

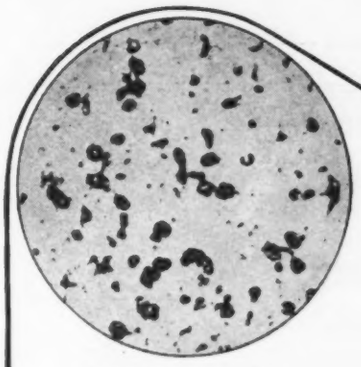
F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

WAREHOUSE PRICES

(Delivered Metropolitan areas, per 100 lb. These prices do not necessarily apply for dislocated tonnage shipments when the f.o.b. City prices are used in conformance with OPA Schedule 49)

CITIES	SHEETS			STRIP		Plates (¼ in. and heavier)	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 ga.)	Cold Rolled	Galv. (24 ga.)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled 2300	Hot Rolled 3100	Cold Drawn 2300	Cold Drawn 3100
Pittsburgh	$3.35	....	$4.65	$3.60	$3.20	$3.40	$3.40	$3.35	$3.65	$7.45	$5.75	$8.40	$6.75
Chicago	3.25	4.10	4.85[1]	3.60	3.50	3.55	3.55	3.50	3.75	7.35	5.65	8.40	6.75
Cleveland	3.35	4.05	4.62	3.50	3.20	3.40	3.58	3.25	3.75	7.55	5.85	8.40	6.75
Philadelphia	3.55	4.05[3]	4.85	3.51	3.31	3.55	3.55	3.85	4.06	7.31	5.86	8.56	7.16
New York	3.58	4.60[2]	5.00	3.96[4]	3.51	3.76	3.75	3.84	4.09	7.60	5.90	8.84	7.19
Detroit	3.43	4.30	4.84[1]	3.68*	3.40	3.60	3.65	3.43	3.80	7.67	5.97	8.70	7.05
Buffalo	3.25	4.30[1]	4.75[4]	3.82	3.52	3.62	3.40	3.35	3.75	7.35	5.65	8.40	6.75
Boston	3.71	4.68	5.11	4.06	3.46	3.85	3.85	3.98	4.13	7.75	6.05	8.88	7.23
Birmingham	3.45[3]	....	4.75[1]	3.70[3]	....	3.55[3]	3.55[3]	3.50[3]	4.48	....	....	....	....
St. Louis	3.39	4.24[2]	4.99[1]	3.74	3.61	3.69	3.69	3.64	4.02	7.72	6.02	8.77	7.12
St. Paul	3.50	4.35	5.00	3.85	3.83	3.80	3.80	3.75	4.34	7.45	6.00	8.84	7.44
Milwaukee	3.38	4.23[2]	4.98[1]	3.73	3.54	3.68	3.68	3.63	3.88	7.58	5.88	8.63	6.98
Baltimore	3.50	....	5.05	4.00	....	3.70	3.70	3.85	4.04	....	....	....	....
Cincinnati	3.42	4.37[2]	4.42[1]	3.67	3.45	3.65	3.68	3.60	4.00	7.69	5.99	8.50	7.10
Norfolk	3.85	....	5.40	4.10	....	4.05	4.05	4.00	4.15	....	....	....	....
Washington	3.60	....	....	4.10	....	3.80	3.80	3.85	4.10	....	....	....	....
Indianapolis	3.45	4.25	5.01[1]	3.75	3.28	3.70	3.70	3.60	3.97	7.67	5.97	8.72	7.07
Omaha	3.85	....	5.52[1]	4.20	....	4.15	4.15	4.10	4.42	....	....	....	....
Memphis	3.85	....	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	4.05	....	....	4.30	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	4.00	....	....	4.30	....	4.05	4.05	3.75	....	....	....	....	....
Los Angeles †	4.95	7.15	5.95	4.90	....	4.90	4.60	4.35	6.60	9.55	8.55	10.55	9.55
San Francisco†	4.55	7.05	6.10	4.50	....	4.65	4.35	3.95	6.80	9.80	8.80	10.80	9.80
Seattle†	4.65[7]	....	5.70[7]	4.25	....	4.75	4.45	4.20	5.75	....	8.00	....	....

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb., galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: [1] 500 to 1499 lb. [2] 400 to 1499 lb. [3] 400 to 3999 lb. [4] 450 to 1499 lb. [5] 1000 to 1999 lb. [6] 0 to 1999 lb. [7] 300 to 10,000 lb. At Philadelphia galvanized sheets, 25 or more bundles; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; San Francisco, hot rolled sheets, 400 to 39,999 lb., galvanized and cold rolled sheets, 750 to 4999 lb., cold fin. bars, 0-299 lb.; hot rolled alloy bars, 0-4999 lb.; Seattle, cold finished bars, 1000 lb. and over, hot rolled alloy bars, 0-1999 lb.; Memphis, hot rolled sheets, 400 to 1999 lb., galvanized sheets, 150 and over; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, cold rolled sheets, 300 to 1999 lb.; galvanized sheets, 1 to 6 bundles; cold finished bars, 1 to 99 lb.; SAE bars, 100 lb. Extras for size, quality, etc., apply on above quotations. * 12 gage and heavier, $3.43. †Los Angeles, San Francisco and Seattle prices reflect special provisions of amendment No. 2 to OPA Price Schedule No. 49.



Notice how evenly the lead is distributed!

FIGHT FRICTION WITH N-B-M "TIGER" BRONZE

Making "TIGER" Bronze for bushings and bearings is an art. During the last 68 years, we have developed a special method of pouring and blending copper, tin and lead into one homogeneous structure. It is this even distribution of the ingredients, especially of lead, that makes "TIGER" Bronze so highly anti-frictional and gives it the strength to endure severest conditions.

Write for our "Tiger" Bronze Chart—showing the hundreds of sizes of cored and solid bars available—rough and machined.

Also send us your prints on miscellaneous bearings and castings—for prompt estimates.

Proudly the "E" Pennant waves over our plant, awarded to us and our fellow workers by the U. S. Navy for the production of naval ordnance.

NATIONAL NBM BEARING METALS CORPORATION

ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes Minimum Wall
(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
	$	$	$
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft. over.....Base
30,000 lb. or ft. to 39,999 lb. or ft. 5%
20,000 lb. or ft. to 29,999 lb. or ft. 10%
10,000 lb. or ft. to 19,999 lb. or ft. 20%
5,000 lb. or ft. to 9,999 lb. or ft. 30%
2,000 lb. or ft. to 4,999 lb. or ft. 45%
Under 2,000 lb. or ft. 65%

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago.....$54.80
6-in. and larger, del'd New York... 52.20
6-in. and larger, Birmingham 46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles..... 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 500 tons or over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago. $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., gross ton $40.00
Angle bars, 100 lb. 2.70
(F.o.b. Basing Points) *Per Gross Ton*
Light rails (from billets) $40 00
Light rails (from rail steel) 39.00
Base per Lb.
Cut spikes .....3.00c.
Screw spikes .....5.15c.
Tie plates, steel .....2.15c.
Tie plates, Pacific Coast .....2.30c.
Track bolts .....4.75c.
Track bolts, heat treated, to railroads ..... 5.00c.
Track bolts, jobbers discount 63-5

Basing Points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans, Domestic, 80%, per gross ton (carloads) $135.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21% $36.00
Domestic, 26 to 28% 49.50

Electric Ferrosilicon

(Per Gross Ton, Delivered Lump Size)

50% (carload lots, bulk) $74.50
50% (ton lots, packed) 87.00
75% (carload lots, bulk) 135.00
75% (ton lots, packed) 151.00

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio $29.50*
Buffalo 30.75*
For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.
*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are $1 a ton above Silvery Iron quotations of comparable analysis.

Ferrochrome

(Per Lb., Contained Cr, Delivered Carlots, Lump Size, on Contract)

4 to 6 carbon .....13.00c.
2 carbon .....19.50c.
1 carbon .....20.50c.
0.10 carbon .....22.50c.
0.06 carbon .....23.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

(Per Gross Ton, Delivered, Carloads, Bulk)

3 carbon $120.00
2.50 carbon 125.00
2 carbon 130.00
1 carbon 140.00

Other Ferroalloys

Ferrotungsten, per lb. contained W, del'd carload $2.00
Ferrotungsten, 100 lb. and less... 2.25
Ferrovanadium, contract, per lb. contained V, del'd .....$2.70 to $2.90†
Ferrocolumbium, per lb. contained Cb, f.o.b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15-18 Ti, 7-8 C, f.o.b. furnace, carload contract, net ton $142.50
Ferrocarbontitanium, 17-20 Ti, 3-5 C, f.o.b. furnace, carload contract, net ton $157.50
Ferrophosphorus, electric or blast furnace materials, carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage freight, equaled with Rockdale, Tenn., gross ton. $58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage, freight equalized with Nashville, gross ton $75.00
Ferromolybdenum, per lb., Mo, f.o.b. furnace ..... 95c.
Calcium molybdate, per lb. Mo., f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52 Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. ..... 80c.
Molybdenum oxide, in cans, per lb. contained Mo, f.o.b. Langeloth, and Washington, Pa. ..... 80c.

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

FLUORSPAR

Fire Clay Brick

Per Net Ton

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail $25.00
Domestic, f.o.b. Ohio River landing barges 25 00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines 25.00
Foreign, 85% calcium fluoride, not over 5% Cl, c.i.f. Atlantic ports, duty paid .....Nominal
Domestic No. 1 ground bulk, 95 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines $34.00
As above, in bags, f.o.b. same mines 36.40

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

Per 1000

Super-duty brick, St. Louis $64.60
First quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois 51.30
First quality, New Jersey 56.00
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois 46.55
Second quality, New Jersey 51.00
No. 1, Ohio 43.00
Ground fire clay, net ton 7.60

Silica Brick

Pennsylvania $51.30
Chicago District 58.90
Birmingham 51.30
Silica cement, net ton (Eastern).. 9.00

Chrome Brick

Per Net Ton

Standard, f.o.b. Baltimore, Plymouth Meeting and Chester $54.00
Chemically bonded, f.o.b. Baltimore, Plymouth Meeting and Chester Pa. 54.00

Magnesite Brick

Standard f.o.b. Baltimore and Chester $76.00
Chemically bonded, f.o.b. Baltimore 65.00

Grain Magnesite

Domestic, f.o.b. Baltimore and Chester in sacks (carloads).....$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk) 22.00

ORES

Lake Superior Ores (51.50% Fe.)

(Delivered Lower Lake Ports)

Per Gross Ton

Old range, bessemer, 51.50 .....$4.75
Old range, non-bessemer, 51.50 .... 4.60
Mesaba, bessemer, 51.50 ..... 4.60
Mesaba, non-bessemer, 51.50 ..... 4.45
High phosphorus, 51.50 ..... 4.35

*Foreign Ores**

(C.i.f. Philadelphia or Baltimore, Exclusive of Duty)

Per Unit

African, 46-48 Mn .....78c. to 80c.
Indian, 48-50 Mn .....75c.
Brazilian, 46-48 Mn .....81c. to 83c.
Cuban, 51 Mn .....85c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered .....$24 to $26
Tungsten, domestic scheelite, at mine .....$24 to $25
Chrome ore, lump, c.i.f. Atlantic Seaboard, per gross ton; South African (low grade) .....$28 to $30
Rhodesian, 45 .....Nom.
Rhodesian, 48 .....Nom.

*Importations no longer readily available. Prices shown are nominal.

COKE*

Furnace

Per Net Ton

†Connellsville, prompt $6.00

Foundry

†Connellsville, prompt ....$6.75 to $7.00

*Maximum by-product coke prices established by OPA became effective Oct. 1, 1941. A complete schedule of the ceiling prices was published in THE IRON AGE, Sept. 25, p. 94B. Maximum beehive furnace coke prices established by OPA, Jan. 26. †F.O.B. oven.

By-product, Chicago $12.25
By-product, New England $13.75
By-product, Newark .....$12.40 to $12.95
By-product, Philadelphia $12.38
By-product, Cleveland $12.30
By-product, Cincinnati $11.75
By-product, Birmingham .....$8.50†
By-product, St. Louis $12.02
By-product, Buffalo $12.50

FUEL OIL

No. 6 Bur. Stsd., del'd Chicago....4.75c.
No. 3 distillate del'd Cleveland ....6.50c.
No. 4 indus., del'd Cleveland .....6.00c.
No. 5 indus., del'd Cleveland .....5.25c.
No. 6 indus., del'd Cleveland 5.25c